



National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

Scientific and Technical Aerospace Reports

STAR

Volume 41

Issue 8

April 18, 2003

WHAT'S INSIDE

- NASA STI Program Overview
- Introduction
- NASA STI Availability Information
- Table of Contents
- Subject Term Index
- Personal Author Index

NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program plays a key part in helping NASA maintain this important role.

The NASA STI Program provides access to the NASA Aeronautics and Space Database, the largest collection of aeronautical and space science in the world. The STI Program is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or major significant phases of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed of continuing reference value. NASA counterpart of peer-reviewed formal professional papers, but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are of preliminary or specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.
- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.

- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that help round out the STI Program's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results ... even providing videos.

The NASA STI Program is managed by the NASA STI Program Office (STIPO). STIPO is the administrative office at Langley Research Center for the NASA STI Program.

For more information about the NASA STI Program, you can:

- Access the NASA STI Program Home Page at <http://www.sti.nasa.gov>
- E-mail your question via the Internet to help@sti.nasa.gov
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Telephone the NASA STI Help Desk at (301) 621-0390
- Write to:
NASA STI Help Desk
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (STAR) is an online information resource listing citations and abstracts of NASA and world wide aerospace-related STI. Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related Research & Development (R&D) results.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to Research & Development (R&D) results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

The NASA Scientific and Technical Information (STI) Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up to date NASA STI, visit the STI Program's website at <http://www.sti.nasa.gov>.

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the NASA Technical Reports Server (TRS) – the publicly available contents of the NASA Aeronautics and Space Database.

Each citation in *STAR* indicates a 'Source of Availability'. When CASI is indicated, the user can order this information directly from CASI using the [STI Online Order Form](#) or contact help@sti.nasa.gov or telephone the CASI Help Desk at 301-621-0390. Before ordering you may access price code tables for STI [documents](#) and [videos](#). When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at <http://www.ntis.gov>.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program (FDLP)** to ensure access by the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal Depository Libraries http://www.access.gpo.gov/su_docs.

The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at <http://www.uspto.gov/patft/>.

Table of Contents

Subject Divisions/Categories

Document citations are grouped by division and then by category, according to the *NASA Scope and Coverage Category Guide*.

Aeronautics

01	Aeronautics (General)	1
02	Aerodynamics	3
03	Air Transportation and Safety	9
05	Aircraft Design, Testing and Performance	9
06	Avionics and Aircraft Instrumentation	12
07	Aircraft Propulsion and Power	12
08	Aircraft Stability and Control	14

Astronautics

12	Astronautics (General)	15
15	Launch Vehicles and Launch Operations	16
16	Space Transportation and Safety	17
18	Spacecraft Design, Testing and Performance	18
19	Spacecraft Instrumentation and Astrionics	20
20	Spacecraft Propulsion and Power	21

Chemistry and Materials

23	Chemistry and Materials (General)	25
24	Composite Materials	29
25	Inorganic, Organic and Physical Chemistry	31
26	Metals and Metallic Materials	38
27	Nonmetallic Materials	44
28	Propellants and Fuels	46

Engineering

31	Engineering (General)	47
32	Communications and Radar	49
33	Electronics and Electrical Engineering	53
34	Fluid Mechanics and Thermodynamics	62
35	Instrumentation and Photography	67
36	Lasers and Masers	71
37	Mechanical Engineering	73
39	Structural Mechanics	75

Geosciences

42	Geosciences (General)	76
43	Earth Resources and Remote Sensing	77

44	Energy Production and Conversion	79
45	Environment Pollution	82
46	Geophysics	86
47	Meteorology and Climatology	94
48	Oceanography	103

Life Sciences

51	Life Sciences (General)	104
52	Aerospace Medicine	136
54	Man/System Technology and Life Support	136
55	Exobiology	138

Mathematical and Computer Sciences

59	Mathematical and Computer Sciences (General)	138
60	Computer Operations and Hardware	142
61	Computer Programming and Software	143
62	Computer Systems	154
63	Cybernetics, Artificial Intelligence and Robotics	158
64	Numerical Analysis	160
65	Statistics and Probability	163
66	Systems Analysis and Operations Research	164
67	Theoretical Mathematics	165

Physics

70	Physics (General)	166
71	Acoustics	184
73	Nuclear Physics	185
74	Optics	186
75	Plasma Physics	189
76	Solid-State Physics	196
77	Physics of Elementary Particles and Fields	197

Social and Information Sciences

80	Social and Information Sciences (General)	201
81	Administration and Management	201
82	Documentation and Information Science	203
85	Technology Utilization and Surface Transportation	208

Space Sciences

88	Space Sciences (General)	208
89	Astronomy	211
90	Astrophysics	217
91	Lunar and Planetary Science and Exploration	225
92	Solar Physics	236
93	Space Radiation	242

General

99	General	242
----	---------------	-----

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for linking to the corresponding document citation from *NASA Thesaurus* terms and personal author names.

[Subject Term Index](#)

[Personal Author Index](#)

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 42, FEBRUARY 13, 2004

01

AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see *categories 02 through 09*. For information related to space vehicles see *12 Astronautics*.

20040008556 Swedish Defence Research Establishment, Tumba

Voltage Gradient Along a Lightning Channel During Strikes to Aircraft

Larsson, A.; Sep. 2002; 20 pp.; In English

Report No.(s): PB2004-101744; FOI-R-0591-SE; Copyright; Avail: National Technical Information Service (NTIS)

Lightning strike to aircraft is a threat to flight safety. During the strike, the lightning channel sweeps along the body of the aircraft. The voltage gradient of the lightning channel is one important property that determines where on the aircraft it may sweep is its voltage gradient. This report presents an analysis of this voltage gradient for the purpose of numerical lightning swept stroke simulations.

NTIS

Lightning; Numerical Analysis

20040008558 National Defence Research Establishment, Umea, Sweden

Effects of Markedly Increased Intravascular Pressure on the Volume-Flow Characteristics in Venous Vessels of Human Limbs

Koelegard, R.; Eiken, O.; Oct. 2002; 80 pp.; In English

Report No.(s): PB2004-101741; FOI-R-0608-SE; Copyright; Avail: National Technical Information Service (NTIS)

Pilots flying high-performance aircraft are exposed to high gravitational forces in the head-to-foot direction. To maintain adequate blood perfusion in the brain during such circumstances arterial pressure a heart level must be markedly increased. Therefore, and because of the large hydrostatic pressure components that act along the vessels, pressure in vascular beds below the heart is commonly raised to levels that are high enough to result in pathological events in the peripheral vasculature. For example, petechial and venolar bleedings as well as pain, presumably due to local vascular overdistension, are common at high G-loads. However, knowledge is still limited as to what extent such extreme elevations of intravascular pressures may induce other, less apparent, pathological events in peripheral vascular beds. During previous studies concerning effects of increased pressure in arm vessels of health humans we have on a few occasions observed antegrade pulsatile flow in the brachial vein in conjunction with markedly increased intravascular pressure. This is a surprising finding since arterial-like pulsatile flow in the veins is usually associated with pathological conditions such as arteriovenous fistulas. The purpose of the present study was to investigate the effect of markedly increased local intravascular pressure on the occurrence of antegrade pulsatile flow in peripheral veins.

NTIS

Tests; Cardiovascular System; Pressure Vessels; Veins

20040010456 Swedish Defence Research Establishment, Stockholm

Unsteady RANS Calculations for the GFSI Bump Preliminary Study Using EURANUS 5.3

Smith, J.; Feb. 2003; In English

Report No.(s): PB2004-101296; FOI-R-0814-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Calculations are presented for unsteady transonic flow over an oscillating bump. The flow field is computed using unsteady RANS method using the FFA-developed CFD code EURANUS with the EARSM turbulence model. Flow solutions

are presented in the time domain and as Fourier series. The results comprise preliminary predictions for experiments to be carried out at the Department of Energy Technology, KTH, Stockholm.

NTIS

Transonic Flow; Computational Fluid Dynamics; Flow Distribution

20040010506 National Renewable Energy Lab., Golden, CO, Windward Engineering, LLC, Salt Lake City, UT, USA
Investigation of the IEC Safety Standard for Small Wind Turbine Design through Modeling and Testing

Jonkman, J.; van Dam, J.; Forsyth, T.; Davis, D.; Jan. 2003; In English

Report No.(s): DE2003-15004457; No Copyright; Avail: National Technical Information Service (NTIS)

Since 1999, the International Electrotechnical Commission (IEC) Maintenance Team 2 (MT2) has been working on a revision of the IEC 61400-2 standard on the safety, quality, integrity, and design requirements of small wind turbines (SWTs). During this effort, a study was conducted to evaluate the quality of the structural design criteria specified by the original -2 standard. Test measurements and aeroelastic predictions of loads were gathered for a collection of SWTs and evaluated against the simplified load models and load cases specified in the standard. The collection of turbines included variations in rotor size, blade number, rotor location (upwind/downwind), hub type (rigid/teetered), yaw mechanism (free/active), and others. In general, the comparison of load measurements and model predictions exemplified the inaccuracy of the design load levels in the original -2 standard and suggested methods of improvement. Revisions being made to the standard include enhanced load models, new load cases, and improved safety factors. This work should culminate in a revised IEC 61400-2 standard that has a higher degree of applicability and dependability than the original.

NTIS

Wind Turbines; Aerodynamic Loads; Aeroelasticity; Loads (Forces)

20040010507 National Renewable Energy Lab., Golden, CO
Demonstration of the Ability of RCAS to Model Wind Turbines

Jonkman, J.; Cotrell, J.; Aug. 2003; In English

Report No.(s): DE2003-15004474; NREL/TP-500-34632; No Copyright; Avail: National Technical Information Service (NTIS)

In recent years, the wind industry has sponsored the development, verification, and validation of comprehensive aeroelastic simulators, which are used by industry, academia, and government entities for wind turbine design, certification, and research. Unfortunately, as wind turbines continue to grow in size, become more flexible, are augmented with sophisticated controllers, and sometimes exhibit unconventional design characteristics, the existing codes do not always support the additional analysis features required for proper design. Examples of analysis options not supported by most wind turbine design codes include aeroelastic stability, a wide variety of aerodynamic modeling options, well-integrated control implementation, modal reduction, and others. These limitations and the increasing need to perform more advanced analyses are motivating the wind industry to search for new and improved analysis tools. The development history, functionality, and advanced nature of RCAS (Rotorcraft Comprehensive Analysis System) make this code a sensible option. RCAS is an aeroelastic simulator developed over a 4-year cooperative effort among the U.S. Army's Aeroflightdynamics Directorate, Advanced Rotorcraft Technology (ART), Inc., and the helicopter industry.

NTIS

Wind Turbines; Rotary Wing Aircraft; Aeroelasticity; Dynamic Loads

20040012893 Swedish Defence Research Establishment, Stockholm, Sweden
Annual Report 2002 on FOI's Research on Air Vehicles (FOT 25)

Hovmark, G.; Apr. 2003; In Swedish; In English

Report No.(s): PB2004-101730; FOI-R-0849-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes work performed at FOI during the period March 2002 - December 2002 under contract from FMV with contract number 238521 - LB584246.

NTIS

Aerospace Industry; Aeroelasticity

20040012918 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory: Transition Process of Boundary Layers on a Low-Speed Wind-Tunnel Contraction Wall

Nishizawa, A.; Sobagaki, T.; Takagi, S.; Tokugawa, N.; Misu, I.; 2003; 28 pp.; In Japanese

Report No.(s): PB2004-102101; NAL-TR-1462; Copyright; Avail: National Technical Information Service (NTIS)

The transition process of boundary layers on a low-speed wind-tunnel contraction wall was experimentally investigated using flow visualizations and hot-wire/hot-film measurements. The process has several classifications depending on the Reynolds number.

NTIS

Boundary Layer Transition; Flow Visualization; Wind Tunnel Walls

02 AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also *34 Fluid Mechanics and Thermodynamics*.

20040010647 Army Research Lab., Aberdeen Proving Ground, MD

Projectile Aerodynamic Jump Due to Lateral Impulsives

Cooper, Gene R.; Sep. 2003; 36 pp.; In English

Contract(s)/Grant(s): Proj-1L1622618H80

Report No.(s): AD-A418825; ARL-TR-3087; No Copyright; Avail: CASI; [A03](#), Hardcopy

The linear theory for spinning projectiles is extended to account for the application of a simple lateral square impulse activated during free flight. Analytical results are shown to produce simple contributions to the familiar aerodynamic jump formulation. Inquiries regarding jump smearing caused by nonzero impulse length are addressed and answered. The formulation shows for sufficiently long- range target interception; lateral impulse trajectory response for a guided projectile is independent of when the impulse is activated during the yaw cycle. Simple mathematical limits show the presented results reducing to those previously found for a zerspinn projectile acted upon by a singular lateral impulse.

DTIC

Aerodynamics; Projectiles; Trajectories

20040010678 Dassault Aviation, Saint-Cloud

CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft

Rosenblum, Jean-Pierre; Hasholder, Jean-Max; Courty, Jean-Claude; Rocca, Xavier; Mar. 2003; 11 pp.; In French; Original contains color illustrations

Report No.(s): AD-A419096; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Delta Wings; Angle of Attack; Computational Fluid Dynamics; Military Aircraft; Vortex Breakdown

20040010680 NORWEGIAN UNIV of SCIENCE and TECHNOLOGY TRONDHEIM DEPT. of APPLIED MECHANICS, Trondheim, Norway

Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure

Norstrud, Helge; Ostman, Anders; Oye, Ivar; Mar. 2003; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419175; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Numerical Analysis; Vortices; Air Flow; Helicopters; Structural Failure; Computerized Simulation; Wind (Meteorology)

20040010684 Rockwell International Corp., Thousand Oaks, CA

PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes

Malmuth, Norman; Cole, J.; Fedorov, A.; Shalaev, V.; Hites, M.; Williams, D.; Mar. 2003; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419176; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Personal Computers; Weapons; Vortices; Aircraft Models; Flow Distribution

20040010735 Research and Technology Organization, Cedex, France

Unsteady Aerodynamic Model for Thin Wings With Evolutive Vortex Sheets

Leroy, Annie; Buron, Franck; Devinant, Philippe; Mar. 2003; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418797; No Copyright; Avail: CASI; [A03](#), Hardcopy

This paper presents recent advances in a computing method for unsteady inviscid incompressible flows around thin lifting surfaces with arbitrary motion. This involves the velocity field, deriving from a potential, the pressure field and the free vortex sheet characteristics (geometry and vortex strength). When considering high angles of attack, the separation lines along which the vortex sheets are shed are the trailing edge, as well as wing tips or parts of the leading edge.

DTIC

Unsteady Aerodynamics; Vortex Sheets; Mathematical Models; Aerodynamic Characteristics; Thin Wings

20040010736 Research and Technology Organization, Cedex, France

Vortex Flow Dilemmas and Control on Wing Planforms on High Speed

Nangia, R. K.; Miller, A.S.; Mar. 2003; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418801; No Copyright; Avail: CASI; [A03](#), Hardcopy

Aircraft for sustained supersonic flight usually feature low aspect ratio wings with varying (reducing) leading edge sweep over the outer portion to achieve an adequate low-speed performance. A high-speed 'cruise' wing then becomes subject to mixed flows at low-speeds including strong Vortical flows.

DTIC

High Speed; Vortices; Wing Planforms; Aircraft Control

20040010780 QinetiQ Ltd., Farnborough, UK

Military Vortices

Lovell, D. A.; Mar. 2003; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419065; No Copyright; Avail: CASI; [A03](#), Hardcopy

The flow control methods being exploited by Micro- electro-mechanical systems (MEMS) devices rely in many cases on the manipulation of small-scale vortices to provide favorable mixing effects. By appropriate design and siting of MEMS very local effects on the flow can be made to provoke large-scale changes in the flow structure and, for example, control the conditions at which the flow separates. This topic area will not be considered further in this paper, but results from current research indicate that military organizations should derive large potential benefits from this technology when it reaches maturity. The remainder of the paper will consider larger-scale separated flows of a vortical nature, which may be steady or time-dependent. In this keynote address, the author reviews the wide range of vortex flows that occur on military vehicles and classifies them into three categories: those designed into a vehicle to improve performance, those that cannot be avoided and whose deleterious effects must be minimized, and those that were not expected to occur. Examples of vortex-flow effects on air and sea vehicles and in propulsion systems are cited to illustrate these categories. It is concluded that vortex flows are all-pervasive and can have major effects on the operation and performance of military vehicles. With the trend to increased diversity in shape for future vehicles it is essential to continue to improve knowledge of and predictive capability for vortex flows. Sections of the paper discuss vortex flows in relation to aerodynamic lift, aerodynamic control surfaces, drag reduction, internal flows in combustion chambers, body vortices, wing vortices, junction effects, chine vortices, intake lips and diverters, ground vortices, vortex wakes, fin buffeting, rear fuselage vortex separations, failure cases, rotorcraft, vehicle build quality and inservice degradation, sea vehicles, and future military vehicles. (23 figures)

DTIC

Vortices; Angle of Attack; Aircraft Design; Boundary Layer Separation

20040010783 Air Force Research Lab., Wright-Patterson AFB, OH

An Experimental Investigation of Leading Edge Vortices and Passage to Stall of Nonslender Delta Wings

Ol, Michael V.; Mar. 2003; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419067; No Copyright; Avail: CASI; [A03](#), Hardcopy

This paper describes an experimental investigation of the structure and decay of the leading edge vortices (LEVs) produced by a nonslender delta wing. The work was conducted in a water tunnel facility at the California Institute of Technology and was sponsored by the Air Force Research Laboratory (AFRL). Stereoscopic digital particle image velocimetry was used to obtain three-component velocity data in planar slices across the flow field above the wing leeward surface. These measurements were motivated by flow visualization through dye injection. Delta wings of 50 degree and 65 degree leading

edge sweep at Reynolds numbers of 8,000 and 14,000, respectively, were studied. For both wings, stable primary LEVs were observed over the entire planform for 5 degree angle of attack and below. For the 50 degree wing, the secondary LEVs were found to decay more abruptly and at a lower angle of attack than the primary LEVs, all but disappearing by 10 degree angle of attack. This suggests a possible predictive criterion for breakdown of the primary vortices, at least at low Reynolds numbers. The entire vortex system undergoes large-scale instabilities in the 12 degree to 20 degree angle of attack range. The leading edge shear layer, however, remains in an organized rolled-up state in this angle of attack range. By 20 degrees, the flow over the leeward side of the wing is completely stalled. (14 figures, 14 refs.)

DTIC

Vortices; Leading Edges; Delta Wings; Flow Distribution

20040010830 Rutgers - The State Univ., Piscataway, NJ

Localized Flow Control in High Speed Flows Using Laser Energy Deposition

Knight, Doyle D.; Yan, Hong; Elliott, Greg; Candler, Graham; Zheltovodov, Alexander; Nov. 30, 2003; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-01-1-0368

Report No.(s): AD-A418928; AFRL-SR-AR-TR-03-0510; No Copyright; Avail: CASI; [A03](#), Hardcopy

The capability for localized flow control in high speed flows using laser energy deposition has been investigated in a collaborative computational and experimental program. Three proposed applications have been comprehensively studied. First, two models of laser energy deposition in air have been developed and validated by comparison with experiment. The first model is an engineering approach wherein the laser energy deposition is treated as an energy release in a perfect gas. The second model is a detailed physical approach which incorporates real gas chemistry with an eleven species model of air. Comparison with experimental measurements of static temperature, density and velocity (one- component) show good agreement with both models outside the plasma region. Second, a detailed 3-D simulation of laser energy deposition upstream of intersecting shocks at Mach 3.45 demonstrated the capability to force transition from Mach Reflection (MR) to Regular Reflection (RR) in the Dual Solution Domain. This result is particularly important for control of MR to RR transition in high speed inlets for scramjet-powered air vehicles. A companion experimental study showed a momentary reduction in the Mach stem height by 70%, but a Mach Reflection was recovered apparently due to freestream turbulence. Third, detailed 3-D simulations of laser energy deposition upstream of an isolated sphere and an Edney IV interaction at Mach 3.45 were performed. Results show the fundamental features observed in the accompanying experiments.

DTIC

Laser Beams; Deposition; Energy Transfer; Fluid Dynamics; High Speed; Temperature Measurement

20040010871 NASA Langley Research Center, Hampton, VA

Technical Evaluation Report, Part A - Vortex Flow and High Angle of Attack

Luckring, James M.; Mar. 2003; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418961; No Copyright; Avail: CASI; [A03](#), Hardcopy

A symposium entitled Vortex Flow and High Angle of Attack was held in Loen, Norway, from May 7 through May 11, 2001. The Applied Vehicle Technology (AVT) panel, under the auspices of the Research and Technology Organization (RTO), sponsored this symposium. Forty-eight papers, organized into nine sessions, addressed computational and experimental studies of vortex flows pertinent to both aircraft and maritime applications. The studies also ranged from fundamental fluids investigations to flight test results, and significant results were contributed from a broad range of countries. The principal emphasis of this symposium was on 'the understanding and prediction of separation-induced vortex flows and their effects on military vehicle performance, stability, control, and structural design loads.' It was further observed by the program committee that 'separation- induced vortex flows are an important part of the design and off-design performance of conventional fighter aircraft and new conventional or unconventional manned or unmanned advanced vehicle designs (UAVs, manned aircraft, missiles, space planes, ground-based vehicles, and ships).' The nine sessions addressed the following topics: vortical flows on wings and bodies, experimental techniques for vortical flows, numerical simulations of vortical flows, vortex stability and breakdown, vortex flows in maritime applications, vortex interactions and control, vortex dynamics, flight testing, and vehicle design. The purpose of this paper is to provide brief reviews of these papers along with some synthesizing perspectives toward future vortex flow research opportunities. The paper includes the symposium program. (15 refs.)

DTIC

Vortices; Angle of Attack; Aerodynamic Characteristics; Military Technology; Hydrodynamics

20040012757 National Research Council of Canada, Ottawa, Ontario, Canada

Unsteady Flows and Airfoil-Vortex Interaction

Mamou, M.; Khalid, M.; Xu, H.; Mar. 2003; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418870; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Airfoils; Unsteady Flow; Blade-Vortex Interaction; Aerodynamic Characteristics; Flow Distribution

20040012761 National Technical Univ., Athens, Greece

An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack

Pantelatos, D. K.; Mathioulakis, D. S.; Mar. 2003; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418874; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Angle of Attack; Axisymmetric Bodies; Cylindrical Bodies; Axisymmetric Flow; Flow Distribution

20040012762

Model of Unsteady Aerodynamic Coefficients of a Delta Wing Aircraft at High Angles of Attack

Planckaert, L.; Mar. 2003; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419038; No Copyright; Avail: CASI; [A03](#), Hardcopy

Studies on the subject of near-stall or post-stall flight have a direct impact on the evaluation of flight safety, on performance in terms of landing distance, and on increases in maneuverability. For several years, new flow control concepts have been studied, and some of them have proven effective in overcoming the difficulties (e.g., loss of control in yaw, asymmetry of forebody, roll instability) involving flight at high angles of attack. At high angles of attack, unsteady aerodynamic forces have to be taken into account since they can account for up to 30% of the maximum aerodynamic lift and can induce strong changes in flight stability. It is necessary to have a precise model of aerodynamic forces and moment to allow the design of efficient control laws and to evaluate the capabilities of a fighter in term of maneuverability. To develop such a model, a specific experimental data set is necessary. Several approaches for modeling the longitudinal aerodynamic coefficients of a fighter aircraft at high angles of attack, including the unsteady effects, are presented. One traditional approach has unsteady effects modeled by means of transfer functions. Another approach uses an internal variable descriptive of the flow field: the vortical state of the flow on the wing. Application of these approaches to modeling using a neural network is presented. (11 figures, 6 refs.)

DTIC

Fighter Aircraft; Vortices; Angle of Attack; Delta Wings; Unsteady Aerodynamics

20040012763 Naval Air Station, Patuxent River, MD

Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7

Gonzalez, Hugo A.; Erickson, Gary E.; McLachlan, Blair G.; Bell, James H.; Mar. 2003; 41 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419050; No Copyright; Avail: CASI; [A03](#), Hardcopy

The objective of this experimental investigation was to understand the impact of small geometry modifications (fillets) at the juncture of a 76 degree sweep leading edge extension (LEX) or strake and a 40 degree sweep cropped delta wing (76/40 double delta wing). A sharp leading edge model was used to depict a generic fighter strake and wing configuration. These fillets were developed to control the shedding, trajectory, and subsequent breakdown of vortices to enhance aircraft aerodynamic performance at subsonic and transonic speeds, and at elevated angles of attack. Longitudinal, lateral, and flow field characteristics of the double delta wing were investigated with different sized linear, diamond, and parabolic shaped fillets. The investigation was conducted in the 7-by-10 foot High Speed Tunnel at the NASA Langley Research Center. The wind tunnel test was conducted from Mach 0.18 to 0.7; Reynolds numbers per foot were from 1.2 to 3.6 x 10(exp 6); angles of attack were from -4 degrees to 42 degrees; and there was zero sideslip. Force and moment, pneumatic pressures, pressure sensitive paint, and vapor screen flow visualization measurements were used to characterize the flow field and to determine longitudinal forces and moments. The fillets increased lift coefficient and reduced induced drag without significantly affecting pitching moment. Pressure sensitive paint showed the increase in lift is caused by an increase in suction and broadening of the vortex suction footprint. Vapor screen results showed the mixing and coalescing of the strake fillet and wing vortices causes the footprint to broaden. The presentation of the experimental results begins with a description of the aerodynamic characteristics

of the baseline 76/40 double delta wing. With the baseline configuration as a basis for comparison, a discussion of the effects of the various fillets follows.

DTIC

Aerodynamic Configurations; Delta Wings; Aircraft Models; Fillets; Wind Tunnel Tests; Transonic Speed; Subsonic Speed

20040012764 National Research Council of Canada, Ottawa, Ontario, Canada

Motion Effects on Leading-Edge Vortex Behavior over Delta Wings and Generalized Modeling

Huang, X. Z.; Hanff, E. S.; Mar. 2003; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419066; No Copyright; Avail: CASI; [A03](#), Hardcopy

Effects of static attitude and three different motions on vortex behavior and its breakdown over delta wings were investigated. These motions include the following: (1) harmonic oscillation or ramp-and-hold motion in roll at constant resultant angle of attack, (2) harmonic oscillation or ramp-and-hold in pitch, and (3) coning at constant resultant angle of attack. A basic 65 degree delta wing configuration was tested in two wind tunnels as well as in a water tunnel. A roll rig, pitch rig, and coning rig (OPLEC) were employed for the investigation. Quite different flow characteristics were found within the spiral vortex breakdown region even under steady conditions. The point where vortex breaks down into large-scale turbulence has a very long response time to perturbations and is the major cause for the dramatic time dependence observed in the airloads. In addition, bi-stable vortex breakdown locations are observed in the case of slender delta wings when breakdown is located close to the trailing edge. Under dynamic conditions, the behavior of the vortex and its breakdown region were found to be highly dependent on motion waveform and reduced angular rates. An analytical model based on the Nonlinear Indicial Response Method and a formulation suggested by Tobak et al. and capable of reflecting the above effects is proposed to predict breakdown location under dynamic conditions.

DTIC

Delta Wings; Leading Edges; Water Tunnel Tests; Mathematical Models

20040012765 Technische Hochschule, Aachen

Normal Shock Vortex Interaction

Thomer, O.; Schroeder, W.; Krause, E.; Mar. 2003; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419068; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Shock Wave Interaction; Vortices; Numerical Analysis; Supersonic Flow

20040012850 Naval Air Station, Patuxent River, MD

Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control

Ghee, Terence A.; Hall, Doug R.; Mar. 2003; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419099; No Copyright; Avail: CASI; [A03](#), Hardcopy

A 4% Uninhabited Combat Air Vehicle (UCAV) has been extensively tested at low speeds in a wind tunnel to investigate using vortex flow control to control vehicle attitude. The program is the initial step to utilize experimental and computational techniques to understand the flowfield environment on a representative low-observable air vehicle and use that understanding to apply an efficient vortex flow control apparatus. Gross flow field characteristics were identified using flow visualization and the approximate vortex location was determined for a number of angles-of-attack for a tunnel dynamic pressure of 26.74 psf. From this study, the model was instrumented with pressure transducers at appropriate locations on the wing and unsteady data was acquired for a number of angles-of-attack and tunnel dynamic pressures. A six-component internal balance was then installed to measure aerodynamic forces and moments. Limited steady electronically scanned pressure data were acquired. Computational fluid dynamic (CFD) analysis was conducted on the model geometry to compare with the results from the wind tunnel study. The results show two vortex structures: a weak apex vortex and a stronger wing vortex. Wing vortex frequency exhibits a broad-banded dominant frequency of approximately 10 Strouhal number. Maximum suction pressure was seen to move forward on the wing leading edge as the wing vortex moved inboard with increasing angle-of-attack. The CFD results adequately predicted the force and moment data. However, the CFD comparison to the unsteady pressure data was not stellar: CFD frequently failed to predict the mean pressure coefficient and the frequency content of the signal.

DTIC

Computational Fluid Dynamics; Vortex Shedding; Wind Tunnel Tests; Drone Vehicles; Wings; Numerical Analysis

20040012924 Lockheed Martin Aeronautical Systems, Marietta, GA

An Assessment of CFD Effectiveness for Vortex Flow Simulation to Meet Preliminary Design Needs

Raj, P.; Finley, D. B.; Ghaffari, F.; Mar. 2003; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419100; No Copyright; Avail: CASI; [A03](#), Hardcopy

The low-speed flight and transonic maneuvering characteristics of combat air vehicles designed for efficient supersonic flight are significantly affected by the presence of free vortices. At moderate-to-high angles of attack, the flow invariably separates from the leading edges of the swept slender wings, as well as from the forebodies of the air vehicles, and rolls up to form free vortices (see Figure 1). The design of military vehicles is heavily driven by the need to simultaneously improve performance and affordability.' In order to meet this need, increasing emphasis is being placed on using Modeling & Simulation environments employing the Integrated Product & Process Development (IPPD) concept. The primary focus is on expeditiously providing design teams with high-fidelity data needed to make more informed decisions in the preliminary design stage. Extensive aerodynamic data are needed to support combat air vehicle design. Force and moment data are used to evaluate performance and handling qualities; surface pressures provide inputs for structural design; and flow-field data facilitate system integration. Continuing advances in computational fluid dynamics (CFD) provide an attractive means of generating the desired data in a manner that is responsive to the needs of the preliminary design efforts. The responsiveness is readily characterized as timely delivery of quality data at low cost.

DTIC

Vortices; Aircraft Design; Flow Distribution

20040012925 Air Force Academy, CO

Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings

Mitchell, Anthony; Morton, Scott; Molton, Pascal; Guy, Yair; Mar. 2003; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419101; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Vortices; Angle of Attack; Delta Wings; Pneumatic Equipment; Boundary Layer Separation

20040012926 National Research Council of Canada, Ottawa, Ontario, Canada

Numerical Modelling of Vortex Flow Instabilities and Interactions

Mokry, M.; Mar. 2003; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419102; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Computerized Simulation; Air Flow; Vortices; Flow Distribution

20040012931 Air Force Research Lab., Wright-Patterson AFB, OH

Design Issues Associated with Full-Scale Application of Active Control of Vortex Flows

Moorhouse, David J.; Mar. 2003; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419109; No Copyright; Avail: CASI; [A03](#), Hardcopy

Control technology is becoming one of the most pervasive aspects of vehicle design and operation. The engine, subsystems, weapons, etc., etc. all have their individual control systems in addition to the flight control system (FCS) of the aircraft overall. In addition, the basic FCS itself is expanding continually with aspects such as thrust vectoring. Research has indicated promising results from the control of the flow fields over an aircraft, and the vortical flow fields in particular. First, the manipulation of forebody vortices to create a lateral force has indicated the potential for significant yaw control at elevated angles of attack (AoA). Benefits can also come from preventing uncommanded asymmetric vortex behavior, which is known to create forces and moments sufficient to cause aircraft to depart from controlled flight. The consideration of vortex flow control includes aspects of both the aerodynamic aircraft model and also use as a control effector. Both of these effects, plus high-angle-of-attack aerodynamics in general, are known to be very non-linear. In addition, experience has shown that the full-scale characteristics are frequently not as predicted.

DTIC

Vortices; Angle of Attack; Aerodynamics; Flight Management Systems

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety* and *85 Technology Utilization and Surface Transportation*.

20040010403 Army Materials and Mechanics Research Center, Watertown, MA

ManTech Journal. Guidelines for Defense Contractors. Volume 8/Number 2

Farrow, Raymond L.; Jan. 1983; 50 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419063; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Integrated Circuits; Ordnance; Contractors

20040010857 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Human Performance Effects of Adaptive Automation of Various Air Traffic Control Information Processing Functions

McClernon, Christopher K.; Jan. 2003; 165 pp.; In English

Report No.(s): AD-A418991; AFIT-CI02-1326; No Copyright; Avail: CASI; [A08](#), Hardcopy

Advanced forms of automation are being considered for application to Air Traffic Control (ATC) in order to reduce controller workload and make higher traffic volumes more manageable. At this point in time there is only limited knowledge of the implications of, for example, Adaptive Automation (AA) on controller performance, workload, and Situation Awareness (SA). The purpose of this research was to (1) define a measure of SA in an ATC simulation that is a sensitive and reliable indicator of automation state changes as part of AA; (2) empirically assess the SA measure for use in investigating AA of various ATC information processing functions; and (3) determine the relationship(s) between AA in the ATC simulation and operator SA. The situation awareness global assessment technique (SAGAT) was considered to be an appropriate candidate measure of SA during AA of an ATC simulation.

DTIC

Air Traffic Control; Workloads (Psychophysiology); Adaptive Control

20040012596 Washington Univ., Saint Louis, MO

Air Transportation Network Routing and Scheduling

Rodin, Ervin Y.; Feb. 28, 2002; 9 pp.; In English

Contract(s)/Grant(s): F49620-99-1-0073

Report No.(s): AD-A419004; AFRL-SR-AR-TR-03-0489; No Copyright; Avail: CASI; [A02](#), Hardcopy

In addition to the completed doctoral dissertations listed above, various other projects were also begun. One which has been completed was the Quick-Look Tool for Tanker Deployment, a project undertaken at the request of AMC/XPY. In addition, yet another doctoral dissertation was in the process of being completed, the: Strategic Brigade Airdrop Simulation and Analysis Project. Furthermore, we have also started on a major effort to combine seamlessly and in a novel way simulation and optimization of the airlift network problems of AMC and TRANSCOM. We expect that effort to culminate in a doctoral dissertation as well. Finally, we established a working relationship with the MDPFR organization (Medical Defense Project in Reinvention) under the initiative of the USAF command Surgeon's office. We intend to undertake some joint projects with them to improve medical services for the DOD.

DTIC

Operations Research; Air Transportation; Transportation Networks

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information see also *18 Spacecraft Design, Testing and Performance*; and *39 Structural Mechanics*. For land transportation vehicles see *85 Technology Utilization and Surface Transportation*.

20040008601 NASA Glenn Research Center, Cleveland, OH, USA

Optimum Climb to Cruise Noise Trajectories for the High Speed Civil Transport

Berton, Jeffrey J.; November 2003; 62 pp.; In English

Contract(s)/Grant(s): WBS 22-714-01-39

Report No.(s): NASA/TM-2003-212704; E-14214; No Copyright; Avail: CASI; [A04](#), Hardcopy

By entraining large quantities of ambient air into advanced ejector nozzles, the jet noise of the proposed High Speed Civil Transport (HSCT) is expected to be reduced to levels acceptable for airport-vicinity noise certification. Away from the airport, however, this entrained air is shut off and the engines are powered up from their cutback levels to provide better thrust for the climb to cruise altitude. Unsuppressed jet noise levels propagating to the ground far from the airport are expected to be high. Complicating this problem is the HSCT's relative noise level with respect to the subsonic commercial fleet of 2010, which is expected to be much quieter than it is today after the retirement of older, louder, domestic stage II aircraft by the year 2000. In this study, the classic energy state approximation theory is extended to calculate trajectories that minimize the climb to cruise noise of the HSCT. The optimizer dynamically chooses the optimal altitude velocity trajectory, the engine power setting, and whether the ejector should be stowed or deployed with respect to practical aircraft climb constraints and noise limits.

Author

Civil Aviation; Supersonic Transports; Jet Aircraft Noise; Climbing Flight; Trajectory Optimization; Cruising Flight; Aircraft Design

20040008868 NASA Langley Research Center, Hampton, VA, USA

Compressibility and Leading-Edge Bluntness Effects for a 65 Deg Delta Wing

Luckring, J. M.; [2004]; 16 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA

Report No.(s): AIAA Paper 2004-0765; No Copyright; Avail: CASI; [A03](#), Hardcopy

A 65 deg. delta wing has been tested in the National Transonic Facility (NTF) at mean aerodynamic chord Reynolds numbers from 6 million to 120 million at subsonic and transonic speeds. The configuration incorporated a systematic variation of the leading edge bluntness. The analysis for this paper is focused on the compressibility and bluntness effects primarily at a Reynolds number of 6 million from this data set. Emphasis is placed upon the onset and progression of leading-edge vortex separation, and compressibility is shown to promote this separation. Comparisons with recent publications show that compressibility and Reynolds number have opposite effects on blunt leading edge vortex separation

Author

Compressibility Effects; Blunt Leading Edges; Delta Wings; Vortices

20040008886 NASA Ames Research Center, Moffett Field, CA, USA

Effects of Blade Sweep on V-22 Whirl Flutter and Loads

Acree, C. W., Jr.; [2003]; 15 pp.; In English; American Helicopter Society 4th Decennial Specialist's Conference on Aeromechanics, 21-23 Jan. 2004, San Francisco, CA, USA; Copyright; Avail: CASI; [A03](#), Hardcopy

A CAMRAD II model of the V-22 Osprey tiltrotor was constructed for the purpose of analyzing the effects of blade design changes on whirl flutter. The model incorporated a dual load-path grip-yoke assembly, a swashplate coupled to the transmission, and a drive train. A multiple-trailer free wake was used for loads calculations. The effects of rotor design changes on whirl-mode stability were calculated for swept blades and offset tip masses. A rotor with swept tips and inboard tuning masses was examined in detail to reveal the mechanisms by which these design changes affect stability and loads. Certain combinations of design features greatly increased whirl-mode stability, with (at worst) moderate increases to loads.

Author

Flutter; Loads (Forces); V-22 Aircraft; Sweep Angle; Rotor Aerodynamics; Rotor Blades (Turbomachinery)

20040010453 Swedish Defence Research Establishment, Stockholm

Review of Aeronautical Fatigue Investigations in Sweden During the Period June 2001 to April 2003

Blom, A. F.; Apr. 2003; In English; 28th Conference of the International Committee on Aeronautical Fatigue, Lucerne, Switzerland, 5-6 May 2003

Report No.(s): PB2004-101289; FOI-R-0850-SE; Copyright; Avail: National Technical Information Service (NTIS)

This document is prepared for presentation at the 28th Conference of the International Committee on Aeronautical Fatigue, scheduled to be held in Lucerne, Switzerland, 5-6 May 2003. A review is given on the work carried out in Sweden in the area of aeronautical fatigue during the period from June 2001 to April 2003. The review includes aircraft loading actions, basic studies of fatigue development in metal and composites, stress analysis and fracture mechanics, studies of crack propagation and residual strength, testing of joints and full-scale structures, and fatigue life predictions. A reference list of

relevant papers issues during the period covered by the review is included.

NTIS

Residual Strength; Fatigue Life; Fracture Mechanics

20040010464 Swedish Defence Research Establishment, Linköping, Sweden

Dynamic Measurement of the Operator for Future System Development

Magnusson, S.; Berggren, P.; Danielsson, B.; Svensson, E.; May 2002; 32 pp.; In Swedish

Report No.(s): PB2004-101529; FOI-R-0430-SE; Copyright; Avail: National Technical Information Service (NTIS)

The goal of the present study was to: measure mental workload, situations awareness (SA) and performance during an air to ground mission in simulated and real flight, compare the correlation between physiological reactions, situation awareness and perceived mental workload, and, based on these correlations, develop causal models. A goal of the study was also to further study the usefulness of the measurement methods in applied and realistic setting. Ten Air Force pilots from Wing 17 flew repeated (three times real flight, three times simulated) air to ground missions. The results show that the common variance between the psycho-physiological measures (heart rate, heart rate variability, and eye movement) is high and that the correlation between simulated and real flight is very high. This shows that the simulation induces the same reactions as real flight. Furthermore, the psychological measures (subjective ratings of workload, SA, and performance) show significant correlations with the psycho-physiological measures. Thus, we can combine these dynamic measures with the subjective ratings with high reliability and validity. The correlations between the measures have provided input to LISREL modeling. The modeling shows that the mental workload perceived by the pilots affect the psycho-physiological reaction with resulting heart rate increases during high mental load. Increases in both perceived mental workload and heart rate affect the situation awareness ratings, which in turn affect the operative performance. The developed model supports earlier findings and models. The results also show the measures used are useful and applicable in applied settings such as regular Air Force exercises, training in the Air Combat Simulation Centre (FLCS) and the Dynamic Flight Simulator (DFS).

NTIS

Human Factors Engineering; Aircraft Noise; Aircraft Performance; Mental Performance; Eye Movements

20040010651 Naval Postgraduate School, Monterey, CA

Upgradable Operational Availability Forecasting Tool For the U.S. Navy P-3 Replacement Aircraft

Margolis, Michael C.; Sep. 2003; 130 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418529; No Copyright; Avail: CASI; [A07](#), Hardcopy

The P-3 Orion maritime aircraft has been the U.S. Navy's primary maritime patrol aircraft since its fleet introduction in 1962, Naval Aviation Systems Command (NAVAIR) has determined that the P-3 fleet has sufficiently aged to warrant a replacement. The replacement aircraft is currently undergoing the conceptual phase of development and it is during this period that NAVAIR is interested in evaluating the trade-off between operational availability and the associated cost to achieve this operational availability. This thesis developed a simulation tool that was used to investigate relationships that affect cost and operational availability of the new (notional) aircraft on a deployment. The simulation tool was exercised for select scenarios in order to gain insights into the value of investing funds in additional aircraft versus the value of investing funds in increased component reliability. The simulation was developed to be very flexible and extensible, enhancing its value for future analyses. Required data inputs into the simulation tool are formatted utilizing a new technology called Extensible Markup Language (XML) which facilitates use of the data in nearly all computer software packages. The model is robust in nature and can be applied to a wide variety of aircraft.

DTIC

Aircraft Design; Component Reliability

20040012587 Human Effectiveness Directorate Wright-Patterson AFB OH, Wright-Patterson AFB, OH, USA

E-3 In-Flight Acoustic Exposure Studies and Mitigation Via Active Noise Reduction Headset

Mobley, Frank; Hall, John A.; Yeager, Donald; Dec. 2002; 73 pp.; In English

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A419313; AFRL-HE-WP-TR-2003-0093; No Copyright; Avail: CASI; [A04](#), Hardcopy

Recordings of the noise environment aboard an E-3 AWACS aircraft were made. The measurements were accomplished according to standard procedures of AFRL aural Displays and Bioacoustics Branch. The measurements were made at various locations in the aircraft during a training sortie. The measurements were accomplished with the current hearing protection device (a David Clark H1076 headset) and an Active Noise Reduction (ANR) headset (a David Clark H1076-XL). It was

determined that the maximum acoustic dose per day for each location was not reached in typical mission durations. But it was found that the ANR headset did provide attenuation comparable to the current headset. The 'Net 4' condition, where one ear cup is worn off of the ear to allow person-to-person communication, made the aircrew reach the daily acoustic exposure in less than 16 hours for most of the positions.

DTIC

Noise Reduction; Ear Protectors; E-3a Aircraft; Bioacoustics; Awacs Aircraft

06

AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also *04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.*

20040012842 NASA Marshall Space Flight Center, Huntsville, AL, USA

Digital Avionics

Koelbl, Terry G.; Ponchak, Denise; Lamarche, Teresa; August 22, 2003; 5 pp.; In English; Copyright; Avail: CASI; [A01](#), Hardcopy

Digital Avionics activities played an important role in the advancements made in civil aviation, military systems, and space applications. This document profiles advances made in each of these areas by the aerospace industry, NASA centers, and the U.S. military. Emerging communication technologies covered in this document include Internet connectivity onboard aircraft, wireless broadband communication for aircraft, and a mobile router for aircraft to communicate in multiple communication networks over the course of a flight. Military technologies covered in this document include avionics for unmanned combat air vehicles and microsatellites, and head-up displays. Other technologies covered in this document include an electronic flight bag for the Boeing 777, and surveillance systems for managing airport operations.

Author (revised)

Avionics; Digital Systems; Aircraft Communication; Communication Networks; Civil Aviation; Airports; Flight Operations

07

AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power; 28 Propellants and Fuels; and 44 Energy Production and Conversion.*

20040008591 Detroit Diesel Allison, Indianapolis, IN, USA

Ultra High Bypass Ratio Low Noise Engine Study

Huff, Dennis, Technical Monitor; Dalton, W. N., III; November 2003; 187 pp.; In English

Contract(s)/Grant(s): NAS3-25950; WBS 22-781-30-12

Report No.(s): NASA/CR-2003-212523; E-14085; Allison-EDR-16083; No Copyright; Avail: CASI; [A09](#), Hardcopy

A study was conducted to identify engine cycle and technologies needed for a regional aircraft which could be capable of achieving a 10 EPNdB reduction in community noise level relative to current FAR36 Stage 3 limits. The study was directed toward 100-passenger regional aircraft with engine configurations in the 15,000 pound thrust class. The study focused on Ultra High Bypass Ratio (UHBR) cycles due to low exhaust jet velocities and reduced fan tip speeds. The baseline engine for this study employed a gear-driven, 1000 ft/sec tip speed fan and had a cruise bypass ratio of 14:1. A revised engine configuration employing fan and turbine design improvements are predicted to be 9.2 dB below current takeoff limits and 12.8 dB below current approach limits. An economic analysis was also done by estimating Direct Operating Cost (DOC).

Author

Bypass Ratio; Low Noise; Turbofan Engines; Aeroacoustics; Technology Utilization

20040010671 Princeton Univ., NJ

Diagnostic Setup for Characterization of Near-Anode Processes in Hall Thrusters

Dorf, L.; Raites, Y.; Fisch, N. J.; May 2003; 12 pp.; In English

Report No.(s): DE2003-814018; PPPL-3817; No Copyright; Avail: Department of Energy Information Bridge

A diagnostic setup for characterization of the near-anode processes in Hall thrusters was designed and assembled.

Experimental results with a single floating probe show that radial probe insertion does not cause perturbations to the discharge and therefore can be used for near-anode measurements.

NTIS

Hall Effect; Hall Thrusters; Floating; Anodes

20040010861 Motoren- und Turbinen-Union G.m.b.H., Munich

Technical Evaluation Report Part B - Heat Transfer and Cooling in Propulsion and Power Systems

Simon, Burkhard; Mar. 2003; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418994; No Copyright; Avail: CASI; [A02](#), Hardcopy

The purpose of the meeting was to give an overview on the latest results of heat transfer and cooling in propulsion and powersystems and to enable the exchange between experts from universities, research organisations and industry. This objective has been achieved in terms of gas turbines. A large number of papers has been presented dealing with heat transfer in gas turbines and here the most discussed part is still the cooled airfoil. The precise knowledge of heat transfer is a precondition for proper cooling and hence improved effectiveness of the gas turbine. The prediction of heat transfer by analytical means remains difficult. Further research is necessary. In terms of non gas turbine applications, e.g. heat transfer and cooling in internal combustion engines or rockets the contribution was very low. Future symposia should either concentrate on heat transfer in gas turbine or take measures to make the event more attractive also for other power systems. However since there is no clear synergy effect between gas turbines and other power systems it is recommended to limit future symposia on gas turbines.

DTIC

Gas Turbines; Heat Transfer

20040012581 Florence Univ., Italy

Heat Transfer Modelling in Gas Turbine Stage

Martelli, F.; Adami, P.; Belardini, E.; Mar. 2003; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419187; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Gas Turbines; Heat Transfer; Computational Fluid Dynamics; Three Dimensional Models

20040012585 Pratt and Whitney Aircraft, East Hartford, CT, USA

The Importance of Cooling Technology in Propulsion and Power Systems

Auxier, Thomas A.; Mar. 2003; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418995; No Copyright; Avail: CASI; [A02](#), Hardcopy

Turbine cooling is the breakthrough technology for gas turbine engines and although the turbine engine and cooling are considered mature technologies, to date they have only achieved about 60 to 70% of the cycle advantage available. Moreover, great improvements have been made in hot section materials and protective coatings, yet without hot section cooling, the high thrust to weight war fighter engine and the high by-pass ratio turbofan engine would be greatly compromised. Specifically, the level of combustor exit temperature of today's engines which is key for improved cycles would be limited to less than 2300 deg F using today's best materials and alloys. Air cooled turbine cooling technology utilizes convection in conjunction with film cooling to achieve combustor exit temperatures at least 1000 deg F higher than the highest combustor exit temperature that could be achieved with just materials alone. Moreover, a stoichiometric turbine would be yet another 1000 deg F higher. Thus, to continue the trend towards stoichiometric capability, hot section cooling technology will be a key ingredient. The open system air cooling technology is comprised of convection and film cooling. Although convection is near its maximum potential, film cooling still has about 50 to 60% of its potential remaining to be utilized. Thus, improved air-cooled technology will most likely concentrate on improved film cooling capability. In addition, closed loop cooling systems will also probably be revisited.

DTIC

Cooling Systems; Gas Turbine Engines; Film Cooling

20040012860 NASA Langley Research Center, Hampton, VA, USA

Exhaust Simulation Testing of a Hypersonic Airbreathing Model at Transonic Speeds

Huebner, Lawrence D.; Witte, David W.; Andrews, Earl H., Jr.; January 2004; 11 pp.; In English; 12th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, 15-18 Dec. 2003, Norfolk, VA, USA

Report No.(s): AIAA Paper 2003-7001; No Copyright; Avail: CASI; [A03](#), Hardcopy

An experimental study was performed to examine jet-effects for an airframe-integrated, scramjet-rocket combined-cycle vehicle configuration at transonic test conditions. This investigation was performed by testing an existing exhaust simulation wind tunnel model, known as Model 5B, in the NASA Langley 16-Ft. Transonic Tunnel. Tests were conducted at freestream Mach numbers from 0.7 to 1.2, at angles of attack from 2 to +14 degrees, and at up to seven nozzle static pressure ratio values for a set of horizontal-tail and body-flap deflections. The model aftbody, horizontal tails, and body flaps were extensively pressure instrumented to provide an understanding of jet-effects and control-surface/plume interactions, as well as for the development of analytical methodologies and calibration of computational fluid dynamic codes to predict this type of flow phenomenon. At all transonic test conditions examined, the exhaust flow at the exit of the internal nozzle was over-expanded, generating an exhaust plume that turned toward the aftbody. Pressure contour plots for the aftbody of Model 5B are presented for freestream transonic Mach numbers of 0.70, 0.95, and 1.20. These pressure data, along with shadowgraph images, indicated the impingement of an internal plume shock and at least one reflected shock onto the aftbody for all transonic conditions tested. These results also provided evidence of the highly three-dimensional nature of the aftbody exhaust flowfield. Parametric testing showed that angle-of-attack, static nozzle pressure ratio, and freestream Mach number all affected the exhaust-plume size, exhaust-flowfield shock structure, and the aftbody-pressure distribution, with Mach number having the largest effect. Integration of the aftbody pressure data showed large variations in the pitching moment throughout the transonic regime.

Author

Air Breathing Engines; Rocket Exhaust; Supersonic Combustion Ramjet Engines

08

AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

20040008871 NASA Langley Research Center, Hampton, VA, USA

Computational Methods for Dynamic Stability and Control Derivatives

Green, Lawrence L.; Spence, Angela M.; Murphy, Patrick C.; [2004]; 18 pp.; In English; 42nd AIAA Applied Aerospace Sciences Conference and Exhibit, 5-8 Jan. 2004, Reno, NV, USA

Report No.(s): AIAA Paper 2004-0015; No Copyright; Avail: CASI; [A03](#), Hardcopy

Force and moment measurements from an F-16XL during forced pitch oscillation tests result in dynamic stability derivatives, which are measured in combinations. Initial computational simulations of the motions and combined derivatives are attempted via a low-order, time-dependent panel method computational fluid dynamics code. The code dynamics are shown to be highly questionable for this application and the chosen configuration. However, three methods to computationally separate such combined dynamic stability derivatives are proposed. One of the separation techniques is demonstrated on the measured forced pitch oscillation data. Extensions of the separation techniques to yawing and rolling motions are discussed. In addition, the possibility of considering the angles of attack and sideslip state vector elements as distributed quantities, rather than point quantities, is introduced.

Author

Force; Moments; Dynamic Stability; Forced Vibration; Simulation

20040010809 Georgia Inst. of Tech., Atlanta, GA, USA

Enabling CSPA Operations Through Pilot Involvement in Longitudinal Approach Spacing

Battiste, Vernol, Technical Monitor; Pritchett, Amy; [2003]; 5 pp.; In English

Contract(s)/Grant(s): NAG2-1314; No Copyright; Avail: CASI; [A01](#), Hardcopy

Several major airports around the USA have, or plan to have, closely-spaced parallel runways. This project complemented current and previous research by examining the pilots ability to control their position longitudinally within their approach stream. This project's results considered spacing for separation from potential positions of wake vortices from the parallel approach. This preventive function could enable CSPA operations to very closely spaced runways. This work also considered how pilot involvement in longitudinal spacing could allow for more efficient traffic flow, by allowing pilots to keep their aircraft within tighter arrival slots than air traffic control (ATC) might be able to establish, and by maintaining space within the arrival stream for corresponding departure slots. To this end, this project conducted several research studies providing an analytic and computational basis for calculating appropriate aircraft spacings, experimental results from a piloted flight

simulator test, and an experimental testbed for future simulator tests. The following sections summarize the results of these three efforts.

Author

Aircraft Approach Spacing; Aircraft Wakes

12

ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

20040008658 Geological Survey, Sioux Falls, SD, USA, Raytheon Information Technology and Scientific Services, Sioux Falls, SD, USA

Derivation of a Tasseled Cap Transformation Based on Landsat 7 At-Satellite Reflectance

Huang, C.; Wylie, B.; Yang, L.; Home, C.; Zylstra, G.; 2003; 14 pp.; In English

Report No.(s): PB2004-102047; No Copyright; Avail: CASI; [A03](#), Hardcopy

The purpose of this paper is to demonstrate the necessity to convert DN to at-satellite reflectance when atmospheric correction is not feasible, and to derive an at-satellite reflectance based tasseled cap transformation. Full explanation of the basic tasseled cap concept and its characteristics was provided in Kauth and Thomas (1976) and Crist and Cicone (1984).

NTIS

Satellite Imagery; Atmospheric Correction; Derivation

20040010474 General Accounting Office, Washington, DC

Business Modernization: Disciplined Processes Needed to Better Manage NASA's Integrated Financial Management Program

Nov. 2003; 32 pp.

Report No.(s): PB2004-102409; GAO-04-118; No Copyright; Avail: CASI; [A03](#), Hardcopy

The National Aeronautics and Space Administration (NASA) has struggled to implement a fully integrated financial management system. The lack of such a system has affected the agency's ability to control program costs, raising concerns about the management of its most costly programs, including the space shuttle program and the International Space Station. In April 2000 NASA initiated the Integrated Financial Management Program (IFMP)--its third effort to improve the agencywide management of its resources. Implementation is expected by fiscal year 2006 with an estimated life-cycle cost of nearly \$1 billion. This report (1) assesses NASA's methodology for preparing the current life-cycle cost estimate for implementing IFMP, (2) determines whether NASA's current schedule is reasonable, and (3) evaluates NASA's processes for ensuring adequate cost contingencies.

NTIS

Aerospace Systems; NASA Programs; Space Shuttles

20040010475 General Accounting Office, Washington, DC

Information Technology: Architecture Needed to Guide NASA's Financial Management Modernization

Nov. 2003; 68 pp.

Report No.(s): PB2004-102412; GAO-04-43; No Copyright; Avail: CASI; [A04](#), Hardcopy

The National Aeronautics and Space Administration (NASA) is in the process of modernizing its financial management operations and supporting information technology systems. This modernization, known as the Integrated Financial Management Program (IFMP), is intended to provide NASA with an agency-wide, integrated approach to performing critical business functions, such as contract management--an area that GAO first designated as high risk in 1990 and continues to do so today. GAO was requested to review various aspects of IFMP, and this report is one in a series on the program. The objective of this review was to determine whether NASA has been acquiring and implementing IFMP in the context of an enterprise architecture GAO is making recommendations to the NASA Administrator for establishing an effective enterprise architecture management capability, ensuring the completeness of future releases of NASA's enterprise architecture, and minimizing its exposure to risk on IFMP caused by system component acquisition and implementation efforts that have

proceeded to date in the absence of an enterprise architecture. NASA concurred with GAO's recommendations and described completed, ongoing, and planned actions to address them.

NTIS

Acquisition; Financial Management; Architecture (Computers); NASA Programs

20040012915 Institute of Space Medico-Engineering, Beijing, China

Hangtian Yixue Yu Yixue Gongcheng) Volume 16, Number 5, October 2003

Wei, J.; 2003; 88 pp.; In Chinese

Report No.(s): PB2004-102104; No Copyright; Avail: CASI; [A05](#), Hardcopy

The report contains research on space medicine and medical engineering.

NTIS

Aerospace Medicine; Medical Science

15

LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

20040010874 Arizona State Univ., Tempe, AZ

Three Corner Sat Constellation

Reed, Helen; Dec. 2002; 12 pp.; In English

Contract(s)/Grant(s): F49620-99-1-0204; Proj-2305

Report No.(s): AD-A418973; AFRL-SR-AR-TR-03-0502; No Copyright; Avail: CASI; [A03](#), Hardcopy

Three Corner Sat (3CS) is a part of the University Nanosatellite Program sponsored by AFOSR, DARPA and NASA GSFC. A joint collaboration among Arizona State University (ASU), the University of Colorado at Boulder (CU), and New Mexico State University (NMSU), the project demonstrates the feasibility of using nanosatellite technology for useful scientific endeavors while minimizing manufacturing and launch costs. 3CS includes a stack of three nearly identical satellites that will be deployed from the Multi-Satellite Deployment System (MSDS), designed by AFRL, after ejection from the Shuttle Hitchhiker Experiment Launch System (SHELS) in the NASA Space Shuttle. While the project has not been manifested on a particular shuttle launch, late 2003 is the anticipated launch date. Primary mission objectives include virtual formation flying, imaging, and end-to-end command and data handling. Secondary mission objectives include demonstrating MEMS micropropulsion technology, modular spacecraft bus design, and student education. This final report is concerned with ASU's responsibilities and designated tasks required to successfully complete the team mission: Program Management of the project at the university level; Configuration Management and Safety; Structures, Mechanisms, Thermal and Radiation; Electrical Power System; Ground Support Equipment; MEMS Micropropulsion Experiment; Integration and Test; and SisterSat.

DTIC

Satellite Constellations; Configuration Management; Ground Support Equipment; Spacecraft Design

20040012611 NASA Marshall Space Flight Center, Huntsville, AL, USA

Advanced Guidance and Control for Hypersonics and Space Access

Hanson, John M.; Hall, Charles E.; Mulqueen, John A.; Jones, Robert E.; [2003]; 10 pp.; In English; JANNAF Interagency Propulsion Committee Joint Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA; Copyright; Avail: CASI; [A02](#), Hardcopy

Advanced guidance and control (AG&C) technologies are critical for meeting safety, reliability, and cost requirements for the next generation of reusable launch vehicle (RLV), whether it is fully rocket-powered or has air-breathing components. This becomes clear upon examining the number of expendable launch vehicle failures in the recent past where AG&C technologies could have saved a RLV with the same failure mode, the additional vehicle problems where this technology applies, and the costs and time associated with mission design with or without all these failure issues. The state-of-the-art in guidance and control technology, as well as in computing technology, is the point where we can look to the possibility of being able to safely return a RLV in any situation where it can physically be recovered. This paper outlines reasons for AWC, current technology efforts, and the additional work needed for making this goal a reality. There are a number of approaches to AG&C that have the potential for achieving the desired goals. For some of these methods, we compare the results of tests designed to demonstrate the achievement of the goals. Tests up to now have been focused on rocket-powered vehicles; application to hypersonic air-breathers is planned. We list the test cases used to demonstrate that the desired results are achieved, briefly

describe an automated test scoring method, and display results of the tests. Some of the technology components have reached the maturity level where they are ready for application to a new vehicle concept, while others are not far along in development.

Author

Reusable Launch Vehicles; Flight Control

20040012940 Air Force Research Lab., USA

A Role for Improved Angular Observations in Geosynchronous Orbit Determination

Sabol, Chris; Sep. 1998; 165 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-8809

Report No.(s): AD-A419356; AFRL-VS-PS-TR-1998-1085; No Copyright; Avail: CASI; [A08](#), Hardcopy

The goal of this thesis showed improved angular observations aided the determination of satellite position and velocity in the geosynchronous orbit regime. Raven was a sensor developed by U. S. Air Force Research Laboratory which allowed for angular observations of satellites to be made with a standard deviation of 1 arc second (which maps into approximately 170 meters at geosynchronous altitude); this was an order of magnitude improvement over traditional angular observation techniques and represented state of the art accuracy of angular observations for geosynchronous orbit determination work. Studies showed these angular observations could be used in the orbit determination process both as the only tracking data source and as a supplement to other tracking data sources such as radar and radio transponder ranges. Results from the radio transponder range analysis were extended to cover Satellite Laser Ranging (SLR) and Global Positioning System (GPS) observation types as well. The studies targeted both space surveillance and owner/operator mission support aspects of orbit determination although the emphasis was on mission support satellite operations. Parameters varied in the simulation studies included the number of observing stations, density of the angular observations, and number of nights of optical tracking.

DTIC

Earth Orbits; Synchronous Satellites; Geosynchronous Orbits

16

SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety*; *15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20040010764 NASA Johnson Space Center, Houston, TX, USA

STS-107 Mission Highlights Resource, Part 2 of 4

[2003]; In English; 55 mins., 31 sec. playing time, in color, with sound

Report No.(s): JSC-1952; No Copyright; Avail: CASI; [V03](#), Videotape-VHS; [B03](#), Videotape-Beta

This video, Part 2 of 4, shows the activities of the STS-107 crew during flight days 4 through 7 of the Columbia orbiter's final flight. The crew consists of Commander Rick Husband, Pilot William McCool, Payload Commander Michael Anderson, Mission Specialists David Brown, Kalpana Chawla, and Laurel Clark, and Payload Specialist Ilan Ramon. During the video the crew members are at work on a variety of spaceborne experiments, such as the Laminar Soot Processes (LSP) experiment, the Mediterranean Israeli Dust Experiment (MEIDEX), international student experiments, and the Structures of Flame Balls at Low Lewis-number (SOFBALL) experiment. Other crew activities recorded on the video include exercising on a bicycle, drawing blood, and answering questions from the public. A couple of scenes on the video are narrated by Clark, including one in which she gives a tour of the SPACEHAB module in the shuttle's payload bay. The video also includes a scene in which Israeli Prime Minister Ariel Sharon addresses Ramon and the other Red Team crew members (Husband, Chawla, Clark). The Earth views shown include Saudi Arabia and the Persian Gulf; the Appalachian Mountains; Egypt, the Red Sea, and the Sinai Peninsula, and the east coast of Africa.

CASI

Columbia (Orbiter); Spacecrews; Spaceborne Experiments

20040010797 NASA Marshall Space Flight Center, Huntsville, AL, USA

Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets

Adams, R. B.; Alexander, R. A.; Chapman, J. M.; Fincher, S. S.; Hopkins, R. C.; Philips, A. D.; Polsgrove, T. T.; Litchford, R. J.; Patton, B. W.; Statham, G., et al.; November 2003; 1 pp.; In English

Report No.(s): NASA/TP-2003-212691; M-1087; No Copyright; Avail: Other Sources; Abstract Only

During FY-2002, a team of engineers from TD30/Advanced Concepts and TD40/Propulsion Research Center embarked on a study of potential crewed missions to the outer solar system. The study was conducted under the auspices of the Revolutionary Aerospace Systems Concepts activity administered by Langley Research Center (LaRC). The Marshall Space Flight Center (MSFC) team interacted heavily with teams from other Centers including Glenn Research Center, LaRC, Jet Propulsion Laboratory, and Johnson Space Center. The MSFC team generated five concept missions for this project. The concept missions use a variety of technologies, including magnetized target fusion (MTF), magnetoplasma dynamic thrusters, solid core reactors, and molten salt reactors in various combinations. The Technical Publication (TP) reviews these five concepts and the methods used to generate them. The analytical methods used are described for all significant disciplines and subsystems. The propulsion and power technologies selected for each vehicle are reviewed in detail. The MSFC team also expended considerable effort refining the MTF concept for use with this mission. The results from this effort are also contained within this TP. Finally, the lessons learned from this activity are summarized in the conclusions section.

Author

Aerospace Systems; Magnetoplasma dynamics; Solar System; Space Exploration

18

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance*; *39 Structural Mechanics*; and *16 Space Transportation and Safety*.

20040008590 NASA Glenn Research Center, Cleveland, OH, USA

Vibration Modal Characterization of a Stirling Convertor via Base-Shake Excitation

Suarez, Vicente J.; Goodnight, Thomas W.; Hughes, William O.; Samorezov, Sergey; November 2003; 13 pp.; In English; First International Energy Conversion Engineering Conference, 17-21 Aug. 2003, Portsmouth, VA, USA

Contract(s)/Grant(s): WBS 22-979-30-01

Report No.(s): NASA/TM-2003-212479; E-14017; AIAA Paper 2003-6096; No Copyright; Avail: CASI; [A03](#), Hardcopy

The U.S. Department of Energy (DOE), Lockheed Martin (LM), Stirling Technology Company (STC), and NASA John H. Glenn Research Center (GRC) are currently developing a high-efficiency Stirling convertor for use in a Stirling Radioisotope Generator (SRG). NASA and DOE have identified the SRG for potential use as an advanced power system for future NASA Space Science missions, providing spacecraft onboard electric power for deep space missions and power for unmanned Mars rovers. Low-level, base-shake sine vibration tests were conducted on the Stirling Technology Demonstration Convertor (TDC), at NASA GRC's Structural Dynamics Laboratory, in February 2001, as part of the development of this Stirling technology. The purpose of these tests was to provide a better understanding of the TDC's internal dynamic response to external vibratory base excitations. The knowledge obtained can therein be used to help explain the success that the TDC enjoyed in its previous random vibration qualification tests (December 1999). This explanation focuses on the TDC's internal dynamic characteristics in the 50 to 250 Hz frequency range, which corresponds to the maximum input levels of its qualification random vibration test specification. The internal dynamic structural characteristics of the TDC have now been measured in two separate tests under different motoring and dynamic loading conditions: (1) with the convertor being electrically motored, under a vibratory base-shake excitation load, and (2) with the convertor turned off, and its alternator internals undergoing dynamic excitation via hammer impact loading. This paper addresses the test setup, procedure and results of the base-shake vibration testing conducted on the motored TDC, and will compare these results with those results obtained from the dynamic impact tests (May 2001) on the nonmotored TDC.

Author

Excitation; Vibration Tests; Structural Vibration; Stirling Engines; Spacecraft Power Supplies; Dynamic Structural Analysis

20040010825 NASA Marshall Space Flight Center, Huntsville, AL, USA

What are the Causes of the Formation of the Sub-Alfvenic Flows at the High Latitude Magnetopause

Avanov, L. A.; Chandler, M. O.; Simov, V. N.; Vaisberg, O. L.; [2003]; 1 pp.; In English; Fall American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

We study magnetopause crossings made by the Interball Tail spacecraft at high latitudes under various interplanetary conditions. When the IMF mostly northward the Interball Tail observes quasi steady state reconnection signatures at the high latitude magnetopause, which include a well-defined de Hoffman-Teller frame, satisfaction of stress balance (Walen relations)

and D-shaped ion velocity distributions. Under variable or southward IMF the high latitude magnetopause is a tangential discontinuity. However, in certain conditions, just after the magnetopause crossing, irrespective of the IMF orientation, decelerate magnetosheath flows are observed in the magnetosheath region adjacent to the high latitude magnetopause. This leads to formation of the region where the sub-Alfvenic flow at high latitudes exists. We suggest that in some cases the dipole tilt plays an important role in the formation of the sub-Alfvenic flows, although in some cases formation the depletion layer is responsible for observation of the sub-Alfvenic flows at the high latitude magnetopause.

Author

Magnetopause; Attitude (Inclination); Discontinuity; Velocity Distribution; Ion Distribution

20040012669 NASA Ames Research Center, Moffett Field, CA, USA

NASA Virtual Glovebox: An Immersive Virtual Desktop Environment for Training Astronauts in Life Science Experiments

Twombly, I. Alexander; Smith, Jeffrey; Bruyns, Cynthia; Montgomery, Kevin; Boyle, Richard; May 30, 2003; 6 pp.; In English; Seventh Multi-Conference on Systemics, Cybernetics and Informatics, 27-30 Jul. 2003, Orlando, FL, USA; Copyright; Avail: CASI; [A02](#), Hardcopy

The International Space Station will soon provide an unparalleled research facility for studying the near- and longer-term effects of microgravity on living systems. Using the Space Station Glovebox Facility - a compact, fully contained reach-in environment - astronauts will conduct technically challenging life sciences experiments. Virtual environment technologies are being developed at NASA Ames Research Center to help realize the scientific potential of this unique resource by facilitating the experimental hardware and protocol designs and by assisting the astronauts in training. The Virtual GloveboX (VGX) integrates high-fidelity graphics, force-feedback devices and real-time computer simulation engines to achieve an immersive training environment. Here, we describe the prototype VGX system, the distributed processing architecture used in the simulation environment, and modifications to the visualization pipeline required to accommodate the display configuration.

Author

Virtual Reality; Gloves; Images

20040012862 NASA Goddard Space Flight Center, Greenbelt, MD, USA

ST7-DRS: A Step Towards Drag-free and High-precision Formation Control

Houghton, M.; Folkner, W.; Hanson, J.; Hruby, V.; [2003]; 1 pp.; In English; 2004 IEEE Aerospace Conference: In-Space Technology Validation Missions, 6-13 Mar. 2004, Big Sky, MT, USA; Copyright; Avail: Other Sources; Abstract Only

The Space Technology 7 Disturbance Reduction System (ST7-DRS) is an in-space technology demonstration within NASA's New Millennium Program. ST7-DRS is designed to validate system-level technologies that are required for future gravity missions (including the planned LISA gravitational-wave observatory) and for future formation-flying interferometer missions (including the planned MAXIM black-hole imager). ST7-DRS is based around a freely-floating test mass contained within a spacecraft structure that will shield this test mass from all external forces (aside from gravity). The spacecraft position will be continuously controlled, such that the spacecraft, itself, will remain centered about this test mass, essentially flying in formation with it. Colloidal micro-thrusters will be used to control the spacecraft's position to within a few nanometers, over time scales of tens to thousands of seconds. In order to detect the residual acceleration noise on the main test mass, a second test mass will be flown alongside the first, within the same physical spacecraft structure. This test mass will serve as a cross-reference for the first, and will also be used as a reference for the spacecraft's attitude control. The spacecraft's attitude will be controlled to an accuracy of a few milli-arc-seconds, also utilizing the colloidal micro-thrusters. ST7-DRS will consist of an instrument package (containing the test masses) and a set of micro-thrusters, which will be attached to the European Space Agency's SMART-2 spacecraft, set to launch in November 2007.

Author

Aerospace Technology Transfer; NASA Programs; Gravitation; Space Missions; Drag Reduction; Formation Flying; Satellite Attitude Control

SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20040010595 California Univ., San Diego, CA, USA

Space Instruments: General Considerations

Arnold, James R.; Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A scientific instrument carried on a spacecraft must of course work well as a scientific instrument. The main requirement is that it be capable of doing a first-rate job, within the other limitations, in returning reliable, meaningful information for its intended purpose(s). This is especially true since missions are very infrequent, so that there may not be another opportunity for years or even decades to study the same questions. The first rule is to use the most reliable components available; their cost is usually considered negligible in the overall budget. These are usually at a minimum 'milspec' parts intended for military use, and hence, among other virtues, shock- and radiation-resistant. Critical parts are individually documented from birth. In reality this isn't always the best strategy -- there is some art here, especially when cost is a real constraint, as it will be more and more in the future. For example, current personal computers and laptops are much more rugged and reliable than the big mainframes of a decade ago. My own hand calculator has survived dropping on the floor many times. My four-year-old PC at home has had no service calls at all. So it may be that consumer devices and parts are in many cases more rugged than anything made in much smaller quantities. For critical functions, where disabling consequences are not extremely improbable, the second line of defense is redundancy. Of course this takes a bite out of scarce resources. It seems to be a rule of experience that electronic components have a life cycle much like humans. That is, there is a (relatively) high mortality soon after birth, followed by a long period of low risk, followed by old age and its inevitable close. Thus components and circuits for space use are normally 'burned in' by being run for an adequate period before being incorporated in the instrument, run again for ground testing, and flown. Third, function often depends on expendables, that is, materials that must be consumed to permit proper instrument function. For instruments, the most familiar examples are cryogenics, solids or occasionally liquids that serve as heat sinks for instruments whose proper operation depends on low, steady temperature. An example is the immensely successful IRAS mission, the first to look broadly at the sky for interesting objects in the infrared. Successful operation of the thermal sensors required a supply of solid helium at temperatures of only a few kelvins. Unforeseen heat leaks or even very short periods at higher temperature could have ended the mission prematurely. Other expendables include propellants for various purposes, although these aren't normally the experimenter's responsibility.

Author

Infrared Astronomy Satellite; Instruments; Radiation Tolerance; Life (Durability); Ground Tests; Central Processing Units

20040010774 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs)

Baker, Charles L.; Grob, Eric W.; McCarthy, Thomas V.; Nikitkin, Michael N.; Ancarrow, Walter C.; [2003]; 22 pp.; In English; International Two-Phase Workshop, 15-17 Sep. 2003, Noordwijk, Netherlands; Copyright; Avail: CASI; [A03](#), Hardcopy

The Geoscience Laser Altimetry System (GLAS) instrument which is the sole instrument on ICESat was launched on January 12, 2003. GLAS utilizes two actively controlled propylene Loop Heat Pipes (LHPs) as the core of its thermal system. The LHPs started quickly when the Dale Ohm starter heaters were powered and have as designed. The low control heater power and on-orbit tight temperature control appear independent of gravity effects when comparing ground testing to flight data. The use of coupling blocks was also unique to these LHPs. Their application reduced control heater power by reducing the subcooling from the radiator. The effectiveness in reducing subcooling of the coupler blocks decreased during flight from ground testing, but internal thermal isolation in the compensation chamber between the subcooled returning liquid increased in flight resulting in no net increase in control heater power versus ground measurements. Overall the application of LHPs in the thermal system for GLAS met instrument requirements and provided flexibility for the overall system as last minute requirements became known.

Author

Ice, Cloud and Land Elevation Satellite; Heat Pipes; Laser Altimeters; Satellite-Borne Instruments; Spacecraft Equipment

20040010820 NASA Ames Research Center, Moffett Field, CA, USA, QSS Group, Inc., Moffett Field, CA, USA
Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles
Pisanich, Greg; Ippolito, Corey; Plice, Laura; Young, Larry A.; Lau, Benton; [2003]; 15 pp.; In English; AIAA Aerospace Sciences Meeting, Intelligent Systems II Session, January 2004, Reno, NV, USA; No Copyright; Avail: CASI; [A03](#), Hardcopy

This paper details the development and demonstration of an autonomous aerial vehicle embodying search and find mission planning and execution strategies inspired by foraging behaviors found in biology. It begins by describing key characteristics required by an aerial explorer to support science and planetary exploration goals, and illustrates these through a hypothetical mission profile. It next outlines a conceptual bio-inspired search and find autonomy architecture that implements observations, decisions, and actions through an 'ecology' of producer, consumer, and decomposer agents. Moving from concepts to development activities, it then presents the results of mission representative UAV aerial surveys at a Mars analog site. It next describes hardware and software enhancements made to a commercial small fixed-wing UAV system, which include a new development architecture that also provides hardware in the loop simulation capability. After presenting the results of simulated and actual flights of bioinspired flight algorithms, it concludes with a discussion of future development to include an expansion of system capabilities and field science support.

Author

Space Exploration; Autonomy; Computer Programs; Augmentation

20

SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, *15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20040008598 NASA Glenn Research Center, Cleveland, OH, USA
Investigation of Low-Voltage/High-Thrust Hall Thruster Operation

Manzella, David; Jacobson, David; November 2003; 14 pp.; In English; 39th Joint Propulsion Conference and Exhibit, 20-23 Jul. 2003, Huntsville, AL, USA

Contract(s)/Grant(s): WBS 22-755-70-05

Report No.(s): NASA/TM-2003-212699; E-14202; AIAA Paper 2003-5004; No Copyright; Avail: CASI; [A03](#), Hardcopy

Performance of low-power and high-power Hall thrusters were experimentally investigated at discharge voltages from 100 to 150 volts. Discharge efficiencies dropped significantly as discharge voltage was decreased over this range. Reductions in discharge efficiency with decreasing discharge voltage were attributed to reductions in ionization efficiency and/or ion acceleration through a potential less than the applied discharge voltage relative to the performance of state-of-art Hall thrusters operating at discharge voltages of 300 volts and above. The low-power Hall thruster exhibited a more pronounced reduction in discharge efficiency with decreasing discharge voltage. This was attributed to increased electron leakage related to the axial distribution of the radial magnetic field. These data demonstrated that the thrust benefit of operating at discharge voltages below 130 volts was offset by a corresponding decrease in discharge efficiency for a given input power.

Author

Hall Thrusters; High Thrust; Low Voltage; Electric Propulsion; Fabrication

20040008600 NASA Glenn Research Center, Cleveland, OH, USA
50 KW Class Krypton Hall Thruster Performance

Jacobson, David T.; Manzella, David H.; November 2003; 16 pp.; In English; 39th Joint Propulsion Conference and Exhibit, 20-23 Jul. 2003, Huntsville, AL, USA

Contract(s)/Grant(s): WBS 22-973-10-35

Report No.(s): NASA/TM-2003-212700; AIAA Paper 2003-4550; E-14203; No Copyright; Avail: CASI; [A03](#), Hardcopy

The performance of a 50-kilowatt-class Hall thruster designed for operation on xenon propellant was measured using krypton propellant. The thruster was operated at discharge power levels ranging from 6.4 to 72.5 kilowatts. The device produced thrust ranging from 0.3 to 2.5 newtons. The thruster was operated at discharge voltages between 250 and 1000 volts. At the highest anode mass flow rate and discharge voltage and assuming a 100 percent singly charged condition, the discharge specific impulse approached the theoretical value. Discharge specific impulse of 4500 seconds was demonstrated at a discharge

voltage of 1000 volts. The peak discharge efficiency was 64 percent at 650 volts.

Author

Hall Thrusters; Krypton; Gaseous Rocket Propellants; Propulsion System Performance; Electric Propulsion

20040008603 QSS Group, Inc., Cleveland, OH, USA

Investigation of the Erosion Characteristics of a Laboratory Hall Thruster

Burke, Thomas, Technical Monitor; Peterson, Peter Y.; Manzella, David H.; November 2003; 14 pp.; In English; 39th Joint Propulsion Conference and Exhibit, 20-23 Jul. 2003, Huntsville, AL, USA

Contract(s)/Grant(s): NAS3-00145; WBS 22-755-04-12

Report No.(s): NASA/CR-2003-212707; AIAA Paper 2003-5005; E-14217; No Copyright; Avail: CASI; [A03](#), Hardcopy

The requirements of spacecraft propulsion systems for new mission profiles have increased beyond the existing level of Hall thruster technology. The range of desired power levels and operating conditions present a challenge for assessing operational lifetime for each case being considered. Therefore, an understanding of the discharge channel erosion processes that limit lifetime is desired. To investigate this, five grades of boron nitride (BN) ceramics were tested at NASA Glenn Research Center (GRC) with a 3-kilowatt (kW), stationary plasma thruster (SPT)-type laboratory Hall thruster. The ceramic discharge channels were tested for 200 hours each with the same thruster and at consistent discharge parameters. An additional test was conducted with a select grade of BN to examine the erosion rate of Hall thruster channel walls by varying the discharge power (at a fixed discharge voltage) and the applied magnetic field topography. A global erosion characteristic profile for the NASA-120M as a function of thruster discharge parameters is examined and the results are discussed.

Author

Erosion; Hall Thrusters; Spacecraft Propulsion; Technology Utilization

20040010322 NASA Glenn Research Center, Cleveland, OH, USA

High Temperature Fusion Reactor Cooling Using Brayton Cycle Based Partial Energy Conversion

Juhasz, Albert J.; Sawicki, Jerzy T.; December 2003; 12 pp.; In English; Space Technology and Applications International Forum, 8-12 Feb. 2003, Albuquerque, NM, USA

Contract(s)/Grant(s): WBS 706-87-02

Report No.(s): NASA/TM-2003-212721; E-14238; No Copyright; Avail: CASI; [A03](#), Hardcopy

For some future space power systems using high temperature nuclear heat sources most of the output energy will be used in other than electrical form, and only a fraction of the total thermal energy generated will need to be converted to electrical work. The paper describes the conceptual design of such a partial energy conversion system, consisting of a high temperature fusion reactor operating in series with a high temperature radiator and in parallel with dual closed cycle gas turbine (CCGT) power systems, also referred to as closed Brayton cycle (CBC) systems, which are supplied with a fraction of the reactor thermal energy for conversion to electric power. Most of the fusion reactor's output is in the form of charged plasma which is expanded through a magnetic nozzle of the interplanetary propulsion system. Reactor heat energy is ducted to the high temperature series radiator utilizing the electric power generated to drive a helium gas circulation fan. In addition to discussing the thermodynamic aspects of the system design the authors include a brief overview of the gas turbine and fan rotor-dynamics and proposed bearing support technology along with performance characteristics of the three phase AC electric power generator and fan drive motor.

Author

Brayton Cycle; Cooling; Energy Conversion; Fusion Reactors; High Temperature; Space Power Reactors

20040010330 NASA Marshall Space Flight Center, Huntsville, AL, USA

Overview of Non-nuclear Testing of the Safe, Affordable 30-kW Fission Engine, Including End-to-End Demonstrator Testing

VanDyke, M. K.; Martin, J. J.; Houts, M. G.; November 2003; 1 pp.; In English

Report No.(s): NASA/TM-2003-212930; M-1095; No Copyright; Avail: Other Sources; Abstract Only

Successful development of space fission systems will require an extensive program of affordable and realistic testing. In addition to tests related to design/development of the fission system, realistic testing of the actual flight unit must also be performed. At the power levels under consideration (3-300 kW electric power), almost all technical issues are thermal or stress related and will not be strongly affected by the radiation environment. These issues can be resolved more thoroughly, less expensively, and in a more timely fashion with nonnuclear testing, provided it is prototypic of the system in question. This approach was used for the safe, affordable fission engine test article development program and accomplished viz cooperative

efforts with Department of Energy labs, industry, universities, and other NASA centers. This Technical Memorandum covers the analysis, testing, and data reduction of a 30-kW simulated reactor as well as an end-to-end demonstrator, including a power conversion system and an electric propulsion engine, the first of its kind in the USA.

Author

Aerospace Systems; Fission; Flight Stability Tests; Temperature Effects

20040010707 National Renewable Energy Lab., Golden, CO, General Motors Corp., Warren, MI, USA

Cold-Start and Warm-Up Driveability Performance of Hybrid Electric Vehicles Using Oxygenated Fuels: Piggyback Project to the Volatility Group Intermediate -Temperature Program (CM-138-02)

Thornton, M.; Jorgensen, S.; Evans, B.; Wright, K.; Oct. 2003; 38 pp.; In English

Report No.(s): PB2004-102472; No Copyright; Avail: CASI; [A03](#), Hardcopy

The Coordinating Research Council (CRC) Volatility Group conducted a program in January and February of 2003 to determine the effect of ethanol content on cold-start and warm-up driveability performance under cool ambient conditions in a large group of late-model vehicles equipped with fuel-injection systems. The goal of the program was to develop concentration-dependent cold-start and warm-up driveability equations for the oxygenate offset of ethanol at cool ambient temperature. The Volatility Group tested 27 conventional vehicles, which were selected from a total fleet of 80 vehicles, based on their response to driveability index (DI) using the highest DI fuel with the highest concentration of ethanol 10 percent. In addition to these 27 vehicles, the CRC Advanced Vehicle/Fuel/Lubricants (AVFL) Committee requested that the Volatility Group test a small number of hybrid electric vehicles (HEVs) using the same fuels and driveability procedure as the core program. The four hybrid vehicles tested included a Honda Civic, a Toyota Prius, and two Honda Insights. This paper details the analysis and results of the driveability performance testing from the four HEVs. The paper also includes a description of the four vehicles, the fuels used, the test location, procedures, and conditions. The results from the 27 conventional vehicles used in the core program will be published in a separate CRC report.

NTIS

Ethyl Alcohol; Performance Tests; Electric Motor Vehicles; Hybrid Propulsion

20040010775 NASA Marshall Space Flight Center, Huntsville, AL, USA

Support of Integrated Health Management (IHM) through Automated Analyses of Flowfield-Derived Spectrographic Data

Patrick, Marshall C.; Cooper, Anita E.; Powers, W. T.; [2003]; 8 pp.; In English; JANNAF Interagency Propulsion Committee, 1-5 Dec. 2003, Colorado Springs, CO, USA; Original contains black and white illustrations; No Copyright; Avail: CASI; [A02](#), Hardcopy

Flow-field analysis techniques under continuing development at NASA's Marshall Space Flight Center are the foundation for a new type of health monitoring instrumentation for propulsion systems and a vast range of other applications. Physics, spectroscopy, mechanics, optics, and cutting-edge computer sciences merge to make recent developments in such instrumentation possible. Issues encountered in adaptation of such a system to future space vehicles, or retrofit in existing hardware, are central to the work. This paper is an overview of the collaborative efforts results, current efforts, and future plans.

Author

Flow Distribution; Propulsion System Configurations; Propulsion System Performance

20040010799 NASA Marshall Space Flight Center, Huntsville, AL, USA

Investigation of Impinging Stream Vortex Chamber Concepts for Liquid Rocket Engine Applications

Trinh, Huu P.; Bullard, Brad; Kopicz, Charles; Michaels, Scott; April 11, 2003; 1 pp.; In English; JANNAF CS/APS/PSHS/MSS Meeting, 3 Dec. 2003, Colorado Springs, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

This paper addresses the progress of technology development of a laser ignition system at NASA Marshall Space Flight Center (MSFC). Initial hot-fire tests in a small-scale rocket chamber at MSFC have demonstrated the dual pulse laser-induced spark (DPLIS) technique, which has an advantage over existing single-pulse laser ignition techniques in that it can be optimized in its laser pulse format to maximize the initial plasma volume, the plasma lifetime, as well as the flame kernel growth rate. The distribution of the total laser energy into two separate pulses also lowers the peak power that would need to be sent through fiber optics to the combustion chamber, making the implementation of this technique more practical than other single-pulse techniques. A first generation prototype of an optic fiber-coupled laser ignition system will be tested a rocket

chamber with RP-1/GOX and GH2/GOX propellants systems. Other relevant technology, such as optical windows, flight-qualified laser system etc. will be discussed in this paper.

Author

Impingement; Liquid Propellant Rocket Engines; Vortices; Thrust Chambers

20040012726 NASA Marshall Space Flight Center, Huntsville, AL, USA

SEP Mission to Titan NEXT Aerocapture In-Space Propulsion (Quicktime Movie)

Baggett, Randy; TECH ISP: Next Generation Ion; January 2004; 2 pp.; In English; No Copyright; Avail: CASI; [A01](#), Hardcopy

The ion thruster is one of the most promising solar electric propulsion (SEP) technologies to support future Outer Planet missions (place provided link below here) for NASA's Office of Space Science. Typically, ion thrusters are used in high Isp-low thrust applications that require long lifetimes, as well as, higher efficiency over state-of-the-art chemical propulsion systems. Today, the standard for ion thrusters is the SEP Technology Application Readiness (NSTAR) thruster. Jet Propulsion Laboratory's (JPL's) extended life test (ELT) of the DS 1 flight spare NSTAR thruster began in October 1998. This test successfully demonstrated lifetime of the NSTAR flight spare thruster, which will provide a solid basis for selection of ion thrusters for future Code S missions. The NSTAR ELT was concluded on June 30, 2003 after 30,352 hours. The purpose of the Next Generation Ion (NGI) activities is to advance Ion propulsion system technologies through the development of NASA's Evolutionary Xenon Thruster (NEXT). The goal of NEXT is to more than double the power capability and lifetime throughput (the total amount of propellant which can be processed) while increasing the Isp by 30% and the thrust by 120%.

Derived from text

Ion Propulsion; Solar Electric Propulsion

20040012729 NASA Marshall Space Flight Center, Huntsville, AL, USA

Space Shuttle Main Engine Implications for the Abort-to-Orbit Off-the-Pad Study

Schoffstoll, Dayna L.; [2003]; 1 pp.; In English; JANNAF Conference, 1 Dec. 2003, Colorado Springs, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

In 2001, the Space Shuttle Main Engine (SSME) project office was contacted by the Space Shuttle Ascent Guidance, Navigation, and Control group to provide the engine perspective for an Abort-to-Orbit (ATO) study. The purpose of the ATO Off-the-Pad study was to determine the feasibility of eliminating the Return to Launch Site and Transatlantic abort modes by using a five-segment solid rocket booster and throttling the remaining SSMEs to a higher power level. This would enable all abort modes to be Abort-to-Orbit. The SSME project office at Marshall Space Flight Center collaborated with MSFC's Space Transportation Directorate and Rocketdyne Propulsion and Power to provide the ATO Off-the-Pad study with the analysis required. Power levels at 109%, 111% and 113% of rated power level were studied as well as mixture ratio decreases down to 5.85. SSME was to evaluate and define the technical and programmatic impacts to certify the SSME to these abort power levels. The SSME systems analysis group performed a steady state analysis using the SSME power balance model to determine if there were any technical issues associated with higher power level, low mixture ratio operation. Based on each power level/mixture ratio combination, an engine certification plan was created and a preliminary probabilistic risk assessment was performed. The results showed favorable results for higher power level/lower mixture ratio SSME operation. In nearly all performance and redline parameters, the traded engine operation was encompassed by nominal engine performance of a prior engine configuration.

Author

Space Shuttle Main Engine; Space Shuttle Boosters

CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20040008595 NASA Glenn Research Center, Cleveland, OH, USA

Thermal Conductivity and Stability of HfO₂-Y₂O₃ and La₂Zr₂O₇ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications

Zhu, Dong-Ming; Bansal, Narottam P.; Miller, Robert A.; November 2003; 14 pp.; In English; 105th Annual Meeting and Exposition, 27-30 Apr. 2003, Nashville, TN, USA

Contract(s)/Grant(s): WBS 22-714-04-30; DA Proj. 1L1-61102-AF-20

Report No.(s): NASA/TM-2003-212544; ARL-TR-3093; E-14110; No Copyright; Avail: CASI; [A03](#), Hardcopy

HfO₂-Y₂O₃ and La₂Zr₂O₇ are candidate thermal and environmental barrier coating (T/EBC) materials for gas turbine ceramic matrix composite (CMC) combustor applications because of their relatively low thermal conductivity and high temperature capability. In this paper, thermal conductivity and high temperature stability of hot-pressed and plasma sprayed specimens with representative partially-stabilized and fully-cubic HfO₂-Y₂O₃ compositions and La₂Zr₂O₇ were evaluated at temperatures up to 1700 C using a steady-state laser heat-flux technique. Sintering behavior of the plasmasprayed coatings was determined by monitoring the thermal conductivity increases during a 20-hour test period at various temperatures. Durability and failure mechanisms of the HfO₂-Y₂O₃ and La₂Zr₂O₇ coatings on mullite/SiC hexoloy or SiC/SiC CMC substrates were investigated at 1650 C under thermal gradient cyclic conditions. Coating design and testing issues for the 1650 C thermal/environmental barrier coating applications are also discussed.

Author

Hafnium Oxides; Thermal Conductivity; Stability; Yttrium Oxides; Lanthanum Compounds; Zirconium Compounds; Thermal Control Coatings; High Temperature

20040008662 Geological Survey, Reston, VA, USA

Mineral Commodity Summaries, 2001

2001; 200 pp.; In English

Report No.(s): PB2004-102067; No Copyright; Avail: CASI; [A09](#), Hardcopy

Published on an annual basis, this report is the earliest Government publication to furnish estimates covering non-fuel mineral industry data. Data sheets contain information on the domestic industry structure, government programs, tariffs, and 5-year salient statistics for over 90 individual minerals and materials.

NTIS

Economics; Minerals; Industries

20040008867 Stanford Linear Accelerator Center, Stanford, CA, USA, Texas Technological Univ., Lubbock, TX, USA, Rensselaer Polytechnic Inst., Troy, NY, USA

Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films

Rajagopalan, T.; Sun, J.; Lahlouh, B.; Lubguban, J. A.; Huang, D. H.; Jun. 2003; 24 pp.; In English

Report No.(s): DE2003-813355; SLAC-PUB-9990; No Copyright; Avail: Department of Energy Information Bridge

Supercritical carbon dioxide (SCCO₂) extraction of a CO(sub 2)-soluble poly (propylene glycol) (PPG) porogen from poly(methylsilsequioxane) (PMSSQ) cured to temperatures adequate to initiate matrix condensation, but still below the decomposition temperature of the porogen is demonstrated to produce nanoporous, ultralow dielectric constant thin films. Both closed and open cell porous structures were prepared simply by varying the porogen load in the organic/inorganic hybrid films. The porogen loads investigated in the present work ranged from 25-55 wt. %. Structural characterization of the samples conducted using transmission electron microscope (TEM), small angle X-ray scattering (SAXS) and Fourier transform infrared spectroscopy (FTIR) confirms the successful extraction of the porogen from the PMSSQ matrix at relatively low temperatures ((le) 200 C). The standard thermal decomposition process is performed at much higher temperatures (typically in the range of 400 C-450 C). The values of dielectric constants and refractive indices measured are in good agreement with the structural properties of these samples.

NTIS

Carbon Dioxide; Porosity; Condensing; Extraction; Thin Films

20040008880 International Business Machines Corp., San Jose, CA, International Business Machines Corp., Yorktown Heights, NY, USA

X-Ray Absorption and Diffraction Studies of Magnetic Nanoparticle Assemblies

Anders, S.; Toney, M. F.; Thomson, T.; Farrow, R. F. C.; Thiele, J. U.; Jun. 2003; 32 pp.; In English

Report No.(s): DE2003-813354; SLAC-PUB-9989; No Copyright; Avail: Department of Energy Information Bridge

We have produced assemblies of FePt nanoparticles using high temperature solution phase synthesis and polymer-mediated layer-by-layer deposition allowing precise control of the particle self-assembly. The as-deposited particles have a narrow size distribution offering the potential for use as ultra-high density magnetic storage media and ultimately storage of one bit per individual nanoparticle. Vibrating sample magnetometry was applied to measure the magnetic properties of the particle assemblies as a function of anneal condition while Near Edge X-ray Absorption Fine Structure (NEXAFS) spectroscopy and x-ray diffraction (XRD) were used to investigate the chemical nature and structural properties. It was found that the coercivity can be as high as 22.7 kOe for samples annealed at 800 degrees C, the moment density (normalized to the particle volume) has a maximum of 1140 emu/cu. cm. for annealing at 650 degrees C equal to the value for bulk FePt. NEXAFS spectroscopy shows that the Fe in the as-deposited assemblies is partly oxidized, and the oxidation is greatly reduced by annealing. XRD indicates an increased formation of the chemically ordered, high anisotropy L10 phase and the onset of nanoparticle agglomeration for annealing at higher temperatures.

NTIS

Nanoparticles; Magnetic Storage; Self Assembly

20040010435 University of Southern Mississippi, Hattiesburg, MS, USA

Stimuli-Responsive Polymers with Enhanced Efficiency in Reservoir Recovery Processes. Semiannual Progress Report for Work Performed September 1, 2001 through February 28, 2002

McCormick, C.; Hester, R.; Apr. 29, 2002; In English

Report No.(s): DE2003-813454; No Copyright; Avail: National Technical Information Service (NTIS)

To date, our synthetic research efforts have been focused on the development of stimuli-responsive water-soluble polymers designed for use in enhanced oil recovery (EOR) applications. These model systems are structurally tailored for potential application as viscosifiers and/or mobility control agents for secondary and tertiary EOR methods. The following report discloses the progress of our ongoing research of polyzwitterions, polymers derived from monomers bearing both positive and negative charges, that show the ability to sustain or increase their hydrodynamic volume (and thus, solution viscosity) in the presence of electrolytes. Such polymers appear to be well-suited for use under conditions similar to those encountered in EOR operations. Additionally, we disclose the synthesis and characterization of a well-defined set of polyacrylamide (PAM) homopolymers that vary by MW. The MW of the PAM samples is controlled by addition of sodium formate to the polymerization medium as a conventional chain transfer agent. Data derived from polymer characterization is used to determine the kinetic parameter CCT, the chain transfer constant to sodium formate under the given polymerization conditions. The PAM homopolymer series will be employed in future set of experiments designed to test a simplified intrinsic viscosity equation.

NTIS

Characterization; Electrolytes

20040010436 FluoreScience, Inc., Oak Ridge, TN, USA, Tennessee Technological Univ., Cookeville, TN, USA

Development of On-Line Temperature Measurement Instrumentation for Gasification Process Control. Semi-annual rept., 4/1/2000-9/31/2000

Noel, B. W.; Oct. 15, 2000; 12 pp.; In English

Report No.(s): DE2003-813680; No Copyright; Avail: Department of Energy Information Bridge

This progress report covers continuing work to develop a temperature probe for a coal gasifier. A workable probe design requires finding answers to crucial questions involving the probe materials. We report on attempts to answer those questions. We received and studied new samples of an important thermographic phosphor, YAG:Dy. We studied the brightness as a function of dopant concentration and the relative brightnesses of the pertinent thermographic emission lines, both with respect to each other and among the phosphors. With the previously reported failure of the binder method for coatings, we are setting up a plasma-spray facility in cooperation with a subcontractor. We have been forming a network of people and organizations that may help us with various aspects of the problems at hand. This period, we approached a company with commercially successful probes, met with Tennessee Valley Authority staff (codes and coatings), and added a new faculty member to the team with materials expertise.

NTIS

Coal Gasification; Temperature Measurement

20040010437 FluoreScience, Inc., Oak Ridge, TN, USA, Tennessee Technological Univ., Cookeville, TN, USA
Development of On-Line Temperature Measurement Instrumentation for Gasification Process Control. Semi-annual rept. ending 4/01/2001

Noel, B. W.; Apr. 15, 2001; 12 pp.; In English

Report No.(s): DE2003-813681; No Copyright; Avail: Department of Energy Information Bridge

This progress report covers continuing work to develop a temperature probe for a coal gasifier. A workable probe design requires finding answers to crucial questions involving the probe materials. We report on attempts to answer those questions. We attempted to measure the laser-input power at a wavelength of 355 nm that would damage the ends of sapphire fiber optics. We were surprised and pleased to learn that they survived an input power density which greatly exceeds the best that fused-silica fibers can do. During a run of our new simulator to obtain an upgraded calibration curve for the improved YAG:Dy phosphors, we found that the phosphor appeared to form a eutectic, with the fused-silica cuvette used to hold the phosphor, when the temperature exceeded 1450 degrees C. This result could have substantial ramifications in this and other high-temperature applications. Our new proprietary detector package that replaced the original photomultiplier tube gave excellent results, with much better signal-to-noise ratio at a given temperature than the old package. Our new plasma-spraying operation has succeeded in spraying YAG, which we think may be a technological breakthrough.

NTIS

Temperature Probes; Coal Gasification

20040010461 Swedish Defence Research Establishment, Tumba
KRYP, a Finite Element Program for Crystal Plasticity

Olovsson, L.; Unosson, M.; Sep. 2002; In Swedish

Report No.(s): PB2004-101522; FOI-R-0551-SE; No Copyright; Avail: National Technical Information Service (NTIS)

KRYP is a finite element program for crystal plasticity simulations. The theory is based on a continuum mechanical approach where dislocations are treated as field variables. During the project, KRYP has been made more user friendly. In addition, new functionalities have been added to the code.

NTIS

Finite Element Method; Computerized Simulation

20040010465 Swedish Defence Research Establishment, Stockholm, Sweden
Annual Report 2002 on Material Science and Technology

Callenas, A.; Feb. 2003; 16 pp.; In Swedish

Report No.(s): PB2004-101535; FOI-R-0781-SE; Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes briefly research conducted at FOI under the Material science and technology program during 2002.

NTIS

Materials Science; Research and Development; Technologies

20040010473 Missouri Dept. of Transportation, Jefferson City, MO, USA
Evaluation of Cracking in Pre-Service and In-Service Snow Plow Carbide Wear Surfaces

MacIver, J.; Dec. 2003; 60 pp.; In English

Report No.(s): PB2004-102389; RDT-03-015; RI 01-023; No Copyright; Avail: CASI; [A04](#), Hardcopy

Purpose of the study was to determine the source of defect propagation in carbide/steel snowplow blade inserts and qualify a Non Destructive Testing (NDT) technique and procedure that which will; (1) locate, quantify and size defects as well as determine whether or not defects originating in the manufacturing process have an impact on blade service life, (2) be able to monitor in-service blades to determine the rate of carbide insert and bond breakdown in the field in order to assess acceptability of various blade insert materials and defect acceptability parameters, and (3) evaluate various carbide insert configurations in the field that could possibly best meet MoDOT snow removal requirements.

NTIS

Carbides; Nondestructive Tests; Cracking (Fracturing)

20040010495 Texas A&M Univ., College Station, TX, USA
Toward an Understanding of Catalysis by Supported Metal Nanoclusters

Goodman, D. W.; Sep. 2003; 22 pp.; In English

Report No.(s): DE2003-813462; No Copyright; Avail: Department of Energy Information Bridge

The goal of this program is an atomic-level understanding of catalysis by supported metal nanoclusters, especially the surface intermediates in selective oxidation by noble metal nanocatalysts.

NTIS

Catalysis; Oxidation

20040010690 Texas Univ., Arlington, TX, USA, Lockheed Martin Energy Systems, Inc., Oak Ridge, TN, USA, Oak Ridge National Lab., TN

Neutronic Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997. Volume 4, Part 6-Esada Plutonium Program Critical Experiments: Power Distribution Measurements

Akkurt, H.; Abdurrahman, N. M.; Primm, R. T.; Barnes, J. M.; Yambert, M. W.; May 2001; 116 pp.; In English
Report No.(s): DE2003-814351; No Copyright; Avail: Department of Energy Information Bridge

In 1967, a series of critical experiments were conducted at the Westinghouse Reactor Evaluation Center (WREC) using mixed-oxide (MOX) PuO₂-UO₂ and/or UO₂ fuels in various lattices and configurations.¹ These experiments were performed under the joint sponsorship of Empire State Atomic Development Associates (ESADA) plutonium program and Westinghouse. The purpose of these experiments was to develop experimental data useful in validating analytical methods used in the design of plutonium-bearing replacement fuel for water reactors. Three different fuel types were used during the experimental program: two MOX fuels and a low-enriched UO₂ fuel. The MOX fuels were distinguished by their ²⁴⁰Pu content: 8 wt % ²⁴⁰Pu and 24 wt % ²⁴⁰Pu. Both MOX fuels contained 2.0 wt % PuO₂ in natural UO₂. The UO₂ fuel with 2.72 wt % enrichment was used for comparison with the plutonium data and for use in multi-region experiments.

NTIS

Uranium Oxides; Neutrons; Mixed Oxides

20040010730 Army Construction Engineering Research Lab., Champaign, IL, USA

Laboratory Evaluation of Moisture Cure Urethane Coatings

Beitelman, Alfred D.; Sep. 2003; 50 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418758; ERDC/CERL-TR-03-18; No Copyright; Avail: CASI; [A03](#), Hardcopy

The Corps of Engineers is considering the use of moisture cure urethane paints on navigation and other hydraulic structures. Since it is desirable to specify paints generically, work was initiated to determine the salient properties of commercially available products from four manufacturers.

DTIC

Coatings; Paints; Hydraulic Equipment

20040010804 Oak Ridge National Lab., TN

Caustic-Side Solvent Extraction: Anti-Caking Surfactants Found to be Cause of Apparent Effect of High Nitrite Concentration on Cesium Stripping

Delmau, L. H.; Haverlock, T. J.; Moyer, B. A.; May 2002; 36 pp.; In English

Report No.(s): DE2003-814440; ORNL/TM-2002/104; No Copyright; Avail: Department of Energy Information Bridge

Experiments conducted in FYOI previously indicated a potential cesium stripping problem in the CSSX process due to the presence of nitrite in the waste simulant. The stripping issue seemed all the more important as the nitrite concentration increased. Experiments presented in this work have demonstrated that the true reason for the cesium stripping problem was in fact the presence of an anti-caking agent in the sodium nitrite used for the preparation of the simulants. The anti-caking agent is actually a mixture of well-known surfactants, sodium mono- and di-methyl naphthalene sulfonate that can partition into the organic- phase on extraction, then retain cesium upon stripping. The effect was demonstrated by adding known amounts of the anti-caking agent to clean systems. Data suggest that rejuvenation of the solvent can be obtained by a caustic wash following the stripping stage.

NTIS

Surfactants; Cesium; Sodium; Nitrites

20040010842 Pennsylvania State Univ., University Park, PA

Thermal Conductivity Evolution During Initial Stage Sintering

Schlaefel, Constance E.; German, Randall M.; Jan. 2002; 10 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418960; C102-1315; No Copyright; Avail: CASI; [A02](#), Hardcopy

The effective thermal conductivity of injection- molded material is useful as a means of monitoring initial stage sintering.

Data obtained via laser flash analysis are inputs for a model relating thermal conductivity to strength. Multiple measurements can be made during a single sintering cycle, detailing the growth of interparticle bonds and onset of handling strength.

DTIC

Thermal Conductivity; Sintering

20040012618 Parsons Engineering Science, Inc., Pasadena, CA, USA

Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation

Wiedemeier, Todd H.; Lucas, Mary A.; Haas, Patrick E.; Jan. 2000; 56 pp.; In English; Original contains color illustrations
Report No.(s): AD-A419018; No Copyright; Avail: CASI; [A04](#), Hardcopy

Natural attenuation processes affect the fate and transport of organic compounds in all hydrologic systems. Over the past several years regulatory agencies and environmental professionals have come to recognize the importance of these natural processes in affecting contaminant attenuation. When they are shown to be protective of human health and the environment, and when a well designed monitoring program is in place to document the efficiency of these processes, they can be a valuable component of site remediation strategies. In April 1999, the Office of Solid Waste and Emergency Response (OSWER) of the USA Environmental Protection Agency (USEPA) published its final policy on the use of natural attenuation, entitled Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (USEPA, 1999). As implied by the title of this policy document, monitoring will be required to evaluate the long-term effectiveness of natural attenuation and to assure protection of human health and the environment. According to the USEPA (1999), the monitoring program designed for each site should specify the location, frequency, and types of samples and measurements necessary to evaluate if the remedy is performing as expected, and if it is capable of attaining remediation objectives.

DTIC

Contaminants; Environment Protection; Organic Compounds

20040012632 Raytheon Systems Co., El Segundo, CA, USA

Tribometric Optical and Electrical Properties of Sputtered Quasicrystalline

Ketola, Kurt S.; Dec. 31, 2002; 25 pp.; In English

Contract(s)/Grant(s): F49620-01-C-0019

Report No.(s): AD-A419022; AFRL-SR-AR-TR-03-0486; No Copyright; Avail: CASI; [A03](#), Hardcopy

Tribometric measurements on as-deposited sputtered AlCuFe films are performed using an oscillating pin-on-flat tribometer located within a high vacuum chamber. The coefficient of friction (COF) is measured as a function of temperature between room temperature and 200 degrees C in vacuum as the flat oscillates relative to the pin at an average sliding speed of 3-4 mm/sec. The COF for all AlCuFe films studied was about 0.5 at room temperature and about 0.25 at 200 degrees C. The reflectance of as deposited and annealed AlCuFe films has been measured across a wavelength range from 0.28 to 26.0 microns. The as-deposited reflectance increases from 0.6 at 1 micron to 0.85 at 20 microns, whereas the reflectance of the annealed film is about 0.6 across the entire wavelength range. The resistivity of an as-deposited film, as measured with a 4-point probe, is about 0.4 milliohm cm, whereas after it is annealed into the icosahedral phase, the resistivity increases almost a factor of four to 1.5 milliohm cm.

DTIC

Optical Properties; Electrical Properties; Coatings; Electrical Resistance

24

COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20040008555 Swedish Defence Research Establishment, Linköping

Production of Nanocomposites

Savage, S. J.; Dec. 2002; 18 pp.; In English

Report No.(s): PB2004-101760; FOI-R-0742-SE; Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes the work done during 2002 towards the production of polymer-based nanocomposite materials. Two other reports have been published during the year, and these present the work in more detail. References to these reports are given. In addition, a presentation was made at the International conference on Nanostructured Materials, July 2002. During this year most emphasis has been placed on synthesis of ferrite nanoparticles with a range of compositions, and preliminary experiments have been made to integrate these into an acrylic polymer matrix. Most recently an apparatus for ultra-violet

curing of polymers has been constructed, and this will be tested before the end of 2002. The focus next year will be to optimize the polymer matrix and functionalization of the nanoparticle surfaces. Initial measurements of the microwave properties of the samples produced have been made. The experiments were successful, but show that the properties of the materials made to date are not those desired.

NTIS

Composite Materials; Mechanical Properties; Nanostructures (Devices)

20040010532 Army Research Lab., Aberdeen Proving Ground, MD

Nondestructive Evaluation of a Metal Matrix Composite

De Rosset, William S.; Dec. 2003; 46 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419365; ARL-TR-3118; No Copyright; Avail: CASI; [A03](#), Hardcopy

Samples of aluminum metal matrix composites (AlMMCs) have been examined with nondestructive evaluation techniques. A literature search identified ultrasonic C-scans as one of the most promising techniques, and this approach was used along with an eddy-current based approach, Meandering Winding Magnetometer (MWM), that also had some potential usefulness for flaw detection. Samples with known flaws were first investigated to ascertain the sensitivity of the equipment. Subsequent tests were performed on samples obtained from the University of Delaware. The findings were that both ultrasonics and MWM could detect gross flaws (cracks, delaminations, lack of matrix infusion, etc.) but that more subtle defects such as fiber waviness could not be detected unequivocally. Since fiber volume content determines to a large extent the strength of that AlMMC, a quantitative relationship between fiber volume content and the sonic velocity was developed. It was also noted that as fiber volume content increased, the ultrasonic signal attenuation increased. High signal attenuation due to high fiber volume content in some of the earlier ultrasonic scans led to a misinterpretation of those scans that was subsequently corrected.

DTIC

Metal Matrix Composites; Nondestructive Tests; Magnetometers; Ultrasonics

20040010792 Oak Ridge National Lab., TN

Aspects of the Mechanical Behavior of Stitched T300 Mat/Urethane 420 IMR Composite

Deng, S.; Li, X.; Weitsman, Y. J.; 2002; 106 pp.; In English

Report No.(s): DE2003-814477; ORNL/TM-2002/86; No Copyright; Avail: Department of Energy Information Bridge

This report presents experimental and analytical results concerning the behavior of crossply and quasi-isotropic laminates manufactured of stitch-bonded T300hurethane 420 IMR polymeric composites. Based on extensive creep and recovery data at various levels of stress and temperature, as well as on strain-to-failure information, it was possible to arrive at empirical expressions relating deformation to the previous input as well as to input duration. These expressions were incorporated within the formalisms of viscoelasticity and laminate theory to illuminate some basic underlying mechanistic aspects of the material at hand, thereby enabling the prediction of anticipated response under more complex stress and temperature inputs.

NTIS

Mechanical Properties; Laminates; Polymer Matrix Composites

20040010793 NASA Ames Research Center, Moffett Field, CA, USA

Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite

Chen, Bin; Li, Jing; Lu, Yijiang; Cinke, Martin; Au, Dyng; Harmon, Julie P.; Muisener, Patricia Anne O.; Clayton, LaNetra; D'Angelo, John; [2003]; 17 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS2-99092; RTOP 704-40-32; Copyright; Avail: CASI; [A03](#), Hardcopy

Using different processing conditions, we disperse the single-walled carbon nanotube (SWNT) into the polymethyl methacrylate (PMMA) to form composites. In the melt-blended sample, the SWNTs originally semiconducting - became predominantly metallic after dispersion into the melt-blended composite. The interaction of the PMMA and SWNT is investigated by the polarized Raman studies. The structure changes in the PMMA and SWNT shows that the anisotropic interactions are responsible for SWNT electronic density of states (DOS) changes. The increased metallic SWNT percentage is confirmed by the conductivity and dielectric constant measurements .

Author

Carbon Nanotubes; Characterization; Composite Materials; Polymethyl Methacrylate; Metal Coatings; Conductivity

20040010860 Army Materials and Mechanics Research Center, Watertown, MA

ManTech Journal. Meeting the Challenge. Volume 10, Number 2, 1985

Jan. 1985; 50 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418972; No Copyright; Avail: CASI; [A03](#), Hardcopy

THE MANTECH JOURNAL is prepared quarterly for the U.S. Army under the sponsorship of the Deputy Chief of Staff for Production, AMC, by the Army Materials and Mechanics Research Center, Watertown, Massachusetts, through the Metals and Ceramics Information Center, Battelle's Columbus Laboratories, Columbus, Ohio. This issue of the Journal contains the following articles: ultrasonic weld bonding of primary structures, image intensifier tube fabrication successful, composite characterization techniques, composite characterization techniques: physiochemical, composite characterization techniques: radiography and brief status reports.

DTIC

Composite Materials; Ultrasonic Welding; Technology Assessment; Metal-Metal Bonding

20040012864 NASA Glenn Research Center, Cleveland, OH, USA

C/SiC Life Prediction for Propulsion Applications

Levine, Stanley R.; Verrilli, Michael J.; Opila, Elizabeth J.; Halbig, Michael C.; Calomino, Anthony M.; Thomas, David J.; October 21, 2002; 9 pp.; In English; JANNAF 39th Combustion Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA

Contract(s)/Grant(s): 708-73-13; No Copyright; Avail: CASI; [A02](#), Hardcopy

Accurate life prediction is critical to successful use of ceramic matrix composites (CMC). The tools to accomplish this are immature and not oriented toward the behavior of carbon fiber reinforced silicon carbide (C/SiC), the primary system of interest for many reusable and single mission launch vehicle propulsion and airframe applications. This paper describes an approach and process made to satisfy the need to develop an integrated life prediction system that addresses mechanical durability and environmental degradation of C/SiC. Issues such as oxidation, steam and hydrogen effects on material behavior are discussed. Preliminary tests indicate that steam will aggressively remove SiC seal coat and matrix in line with past experience. The kinetics of water vapor reaction with carbon fibers is negligible at 600 C, but comparable to air attack at 1200 C. The mitigating effect of steam observed in fiber oxidation studies has also been observed in stress rupture tests. Detailed microscopy of oxidized specimens is being carried out to develop the oxidation model. Carbon oxidation kinetics are reaction controlled at intermediate temperatures and diffusion controlled at high temperatures (approximately 1000 C). Activation energies for T-300 and interface pyrolytic carbon were determined as key inputs to the oxidation model. Crack opening as a function of temperature and stress was calculated. Mechanical property tests to develop and verify the probabilistic life model are very encouraging except for residual strength prediction. Gage width is a key variable governing edge oxidation of seal coated specimens. Future efforts will include architectural effects, enhanced coatings, biaxial tests, and LCF. Modeling will need to account for combined effects.

Author

Carbon; Silicon Carbides; Ceramic Matrix Composites; Mechanical Properties; Coatings; Spacecraft Propulsion; Life (Durability)

25

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

20040008586 Oregon Dept. of Transportation, Salem, OR, USA

Washing Bridges to Reduce Chloride

Soltesz, S.; Dec. 2003; 32 pp.; In English

Report No.(s): PB2004-101919; SPR 304-031; No Copyright; Avail: CASI; [A03](#), Hardcopy

Chloride ions are known to promote the corrosion of steel in reinforced concrete. This project was undertaken to investigate the efficacy of washing, to reduce chloride content and chloride ion uptake. The project consists of a laboratory and a field component over a period of four years. In the field component test sections of a coastal bridge have been pressure washed on a once per year and twice per year schedule. A set of washing trials is also being conducted on concrete blocks exposed to salt water in the laboratory, to determine whether chloride ions can be removed from the concrete and whether the ingress of chloride ions can be reduced. After two years, the effect of washing on removing chloride ions was inconclusive,

but washing did reduce the uptake of chloride ions by up to 89%. Chloride levels decreased with a washing cycle of once per day, but no change was observed with washing cycles of once per week or once per month. Based on these results, field testing on the bridge was discontinued. The laboratory washing will continue for another two years.

NTIS

Composite Materials; Ions

20040008881 California Univ., Berkeley, CA

Photon-Counting Single-Molecule Spectroscopy for Studying Conformational Dynamics and Macromolecular Interactions

Laurence, T. A.; 2002; In English

Report No.(s): DE2003-813378; No Copyright; Avail: National Technical Information Service (NTIS)

Single-molecule methods have the potential to provide information about conformational dynamics and molecular interactions that cannot be obtained by other methods. Removal of ensemble averaging provides several benefits, including the ability to detect heterogeneous populations and the ability to observe asynchronous reactions. Single-molecule diffusion methodologies using fluorescence resonance energy transfer (FRET) are developed to monitor conformational dynamics while minimizing perturbations introduced by interactions between molecules and surfaces. These methods are used to perform studies of the folding of Chymotrypsin Inhibitor 2, a small, single-domain protein, and of single-stranded DNA (ssDNA) homopolymers. Confocal microscopy is used in combination with sensitive detectors to detect bursts of photons from fluorescently labeled biomolecules as they diffuse through the focal volume. These bursts are analyzed to extract fluorescence resonance energy transfer (FRET) efficiency. Advances in data acquisition and analysis techniques that are providing a more complete picture of the accessible molecular information are discussed.

NTIS

Dynamics; Spectroscopy; Molecular Interactions; Biochemistry; Energy Transfer

20040008882 NASA Ames Research Center, Moffett Field, CA, USA

Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore

Vercoutere, W.; Solbrig, A.; DeGuzman, V.; Deamer, D.; Akeson, M.; [2003]; 1 pp.; In English; Biophysical Society Meeting, 14-18 Feb. 2004, Baltimore, MD, USA; No Copyright; Avail: Other Sources; Abstract Only

We use a biological nano-scale pore to distinguish among individual DNA hairpins that differ by a single site of oxidation or a nick in the sugar-phosphate backbone. In earlier work we showed that the protein ion channel alpha-hemolysin can be used as a detector to distinguish single-stranded from double-stranded DNA, single base pair and single nucleotide differences. This resolution is in part a result of sensitivity to structural changes that influence the molecular dynamics of nucleotides within DNA. The strand cleavage products we examined here included a 5-base-pair (5-bp) hairpin with a 5-prime five-nucleotide overhang, and a complementary five-nucleotide oligomer. These produced predictable shoulder-spike and rapid near-full blockade signatures, respectively. When combined, strand annealing was monitored in real time. The residual current level dropped to a lower discrete level in the shoulder-spike blockade signatures, and the duration lengthened. However, these blockade signatures had a shorter duration than the unmodified 10bp hairpin. To test the pore sensitivity to nucleotide oxidation, we examined a 9-bp hairpin with a terminal 8-oxo-deoxyguanosine (8-oxo-dG), or a penultimate 8-oxo-dG. Each produced blockade signatures that differed from the otherwise identical control 9bp hairpins. This study showed that DNA structure is modified sufficiently by strand cleavage or oxidation damage at a single site to alter in a predictable manner the ionic current blockade signatures produced. This technique improves the ability to assess damage to DNA, and can provide a simple means to help characterize the risks of radiation exposure. It may also provide a method to test radiation protection.

Author

Deoxyribonucleic Acid; Detection; Oxidation; Molecules; Nanotechnology; Molecular Biology

20040008919 Kentucky Univ., Lexington, KY, USA, Sandia Labs., Albuquerque, NM, USA, General Atomics Co., San Diego, CA

Initial Screening of Thermochemical Water-Splitting Cycles for High Efficiency Generation of Hydrogen Fuels Using Nuclear Power

Brown, L. C.; Funk, J. F.; Showalter, S. K.; Apr. 2000; 32 pp.; In English

Report No.(s): DE2003-761610; GA-A23373; No Copyright; Avail: Department of Energy Information Bridge

There is currently no large scale, cost-effective, environmentally attractive hydrogen production process, nor is such a

process available for commercialization. Hydrogen is a promising energy carrier, which potentially could replace the fossil fuels used in the transportation sector of our economy. Fossil fuels are polluting and carbon dioxide emissions from their combustion are thought to be responsible for global warming. The purpose of this work is to determine the potential for efficient, cost-effective, large-scale production of hydrogen utilizing high temperature heat from an advanced nuclear power station. Almost 800 literature references were located which pertain to thermochemical production of hydrogen from water and over 100 thermochemical watersplitting cycles were examined. Using defined criteria and quantifiable metrics, 25 cycles have been selected for more detailed study.

NTIS

Air Pollution; Carbon Dioxide; Hydrogen Fuels; Hydrogen Production; Nuclear Power Plants

20040010359 NASA Ames Research Center, Moffett Field, CA, USA

Investigating the Partitioning of Inorganic Elements Consumed by Humans between the Various Fractions of Human Wastes: An Alternative Approach

Wignarajah, Kanapathipillai; Pisharody, Suresh; Fisher, John W.; [2003]; 7 pp.; In English

Contract(s)/Grant(s): NAS2-14263

Report No.(s): SAE-2003-01-2371; Copyright; Avail: CASI; [A02](#), Hardcopy

The elemental composition of food consumed by astronauts is well defined. The major elements carbon, hydrogen, oxygen, nitrogen and sulfur are taken up in large amounts and these are often associated with the organic fraction (carbohydrates, proteins, fats etc) of human tissue. On the other hand, a number of the elements are located in the extracellular fluids and can be accounted for in the liquid and solid waste fraction of humans. These elements fall into three major categories - cationic macroelements (e.g. Ca, K, Na, Mg and Si), anionic macroelements (e.g. P, S and Cl and 17 essential microelements, (e.g. Fe, Mn, Cr, Co, Cu, Zn, Se and Sr). When provided in the recommended concentrations to an adult healthy human, these elements should not normally accumulate in humans and will eventually be excreted in the different human wastes. Knowledge of the partitioning of these elements between the different human waste fractions is important in understanding (a) developing waste separation technologies, (b) decision-making on how these elements can be recovered for reuse in space habitats, and (c) to developing the processors for waste management. Though considerable literature exists on these elements, there is a lack of understanding and often conflicting data. Two major reasons for these problems include the lack of controlled experimental protocols and the inherently large variations between human subjects (Parker and Gallagher, 1988). We have used the existing knowledge of human nutrition and waste from the available literature and NASA documentation to build towards a consensus to typify and chemically characterize the various human wastes. It is our belief, that this could be a building block towards integrating a human life support and waste processing in a closed system.

Author

Human Wastes; Chemical Elements; Inorganic Compounds; Food Intake

20040010368 Tohoku Univ., Sendai, Japan, Akita National Coll. of Technology, Akita, Japan, Japan Atomic Energy Research Inst., Takasaki, Japan, Stanford Linear Accelerator Center, Stanford, CA, USA

Time-Resolved Photoelectron Spectroscopy of Oxidation on the Ti(0001) Surface

Takakuwa, Y.; Ishidzuka, S.; Yoshigoe, A.; Teraoka, Y.; Mizuno, Y.; Mar. 2003; 16 pp.; In English

Report No.(s): DE2003-812993; SLAC-PUB-9697; No Copyright; Avail: Department of Energy Information Bridge

High-resolution photoelectron spectroscopy using synchrotron radiation was applied for monitoring in real time the oxidation kinetics on the Ti(0001) surface at 405 degrees C with dry O₂ gas. The time evolution of O 1s photoelectron intensity showed a linear uptake curve up to approx. 90 L followed by a sudden saturation up to approx. 160 L and then a restart of the linear increase, indicating that O₂ adsorption obeys a zero-order reaction scheme before and after the saturation. Corresponding to the first linear uptake and saturation, the surface core level shift (SCLS) component of Ti 2p decreased predominantly and disappeared completely, and appeared again after the saturation and remained persistently during TiO₂ growth. Thus the zero-order reaction of O₂ adsorption on the Ti(0001) surface at 405 degrees C is concerned with the metallic Ti layer on the outermost surface.

NTIS

Corrosion Prevention; Photoelectron Spectroscopy; Titanium Alloys

20040010399 Scripps Institution of Oceanography, La Jolla, CA

Biological Controls on the Precipitation of Chromium in Harbor Sediments

Tebo, Bradley M.; Obraztsova, Anna Y.; Dec. 2, 2003; 7 pp.; In English

Contract(s)/Grant(s): N00014-99-1-0107

Report No.(s): AD-A419055; No Copyright; Avail: CASI; [A02](#), Hardcopy

The overall goal of this project was to evaluate the processes involved in the attenuation of hexavalent chromium (Cr(VI)) contamination in harbor sediments. Specifically our objectives were to 1) evaluate the mechanisms of Cr(VI) reduction in harbor sediments; 2) evaluate whether bacteria can couple their growth on organic matter to Cr(VI) reduction and if so, whether there is a hierarchy in the use of electron acceptors by these bacteria; and 3) to determine the effects of Cr(VI) on metal- and sulfate-reducing activities and consequential precipitation of Cr. Batch culture and harbor sediment mesocosm experiments examining the effect of Cr(VI) on microbial diversity and processes were performed. The results indicate that Cr(VI) reduction occurs in surficial harbor sediments as a result of microbial activities, primarily those of facultative anaerobic metal-reducing bacteria. As a result, Cr accumulates in the surface sediments. Bacteria capable of using Cr(VI) as an electron acceptor for oxidation of organic matter in the absence of oxygen were isolated and characterized. Cr(VI, even at moderately low levels, dramatically impacts the microbial communities found in sediments.

DTIC

Chromium; Acceptor Materials; Electron Transfer; Contamination

20040010439 Lehigh Univ., Bethlehem, PA, USA, Oak Ridge National Lab., TN

Fe-Al Weld Overlay and High-Velocity Oxy-Fuel Thermal Spray Coatings for Corrosion Protection of Waterwalls in Fossil Fired Plants with Low NO_x Burners

Regina, J. R.; Dupont, J. N.; Marder, A. R.; Jan. 02, 2002; 126 pp.; In English

Report No.(s): DE2003-814323; ORNL/SUB/95-SU604/04; No Copyright; Avail: Department of Energy Information Bridge

Iron-aluminum-chromium coatings were investigated to determine the best candidates for coatings of boiler tubes in Low NO_x fossil fueled power plants. Ten iron-aluminum-chromium weld claddings with aluminum concentrations up to 10wt% were tested in a variety of environments to evaluate their high temperature corrosion resistance. The weld overlay claddings also contained titanium additions to investigate any beneficial effects from these ternary and quaternary alloying additions. Several High-Velocity Oxy-Fuel (HVOF) thermal spray coatings with higher aluminum concentrations were investigated as well. Overall, it was concluded that of the coatings studied weld overlay coatings provide superior protection in these Low NO_x environments; specifically, the ternary weld composition of 10wt%Al and 5wt%Cr provided the best corrosion protection in all of the environments tested.

NTIS

Corrosion Resistance; Aluminum Coatings

20040010493 California Univ., Berkeley, CA

Ultrafast Infrared Studies of Complex Ligand Rearrangements in Solution

Payne, C. K.; 2003; In English

Report No.(s): DE2003-813391; No Copyright; Avail: National Technical Information Service (NTIS)

The complete description of a chemical reaction in solution depends upon an understanding of the reactive molecule as well as its interactions with the surrounding solvent molecules. Using ultrafast infrared spectroscopy it is possible to observe both the solute-solvent interactions and the rearrangement of complex ligands and the spectroscopic techniques necessary for the determination of these mechanisms.

NTIS

Solvents; Solutes; Chemical Reactions

20040010537 Naval Research Lab., Bay Saint Louis, MS

A Comparison of Biotic and Inorganic Sulfide Films

Lee, Jason S.; Ray, Richard I.; Little, Brenda J.; Jan. 2003; 10 pp.; In English

Report No.(s): AD-A418884; NRL/PP/7303/03/0054; No Copyright; Avail: CASI; [A02](#), Hardcopy

Distribution, tenacity and chemical composition of sulfide films produced by bacteria within biofilms were compared with those produced by waterborne inorganic sulfides. Attempts were made to differentiate corrosion mechanisms of alloy 400(70Ni-30Cu) exposed to seawater in the presence or absence of sulfate-reducing bacteria (SRB). Experiments were conducted in an anaerobic environment in the presence of inorganic sulfide and SRB either eely corroding or coupled to an external cathode (alloy 400) exposed in aetobic media. Sulfur concentration in corrosion products increased in the presence of SRB and/or an external cathode. Bacteria encrusted with corrosion products and integrated into the sulfide film were only observed in the presence of SRB.

DTIC

Corrosion; Bacteria; Sulfates; Microbiology; Inorganic Materials; Copper Alloys; Nickel Alloys

20040010546 Air Force Research Lab., Wright-Patterson AFB, OH

Flux-Pinning of Bi₂Sr₂CaCu₂O_{8+delta} High Tc Superconducting Tapes Utilizing (Sr,Ca)₁₄Cu₂₄O_(41+delta) and Sr₂CaAl₂O₆ Defects

Haugan, T.; Wong-Ng, W.; Cook, L. P.; Swartzendruber, L.; Brown, H. J.; Shaw, David T.; Oct. 2003; 15 pp.; In English
Report No.(s): AD-A418889; AFRL-PR-WP-TP-2003-205; No Copyright; Avail: CASI; [A03](#), Hardcopy

Efforts to improve the magnetic flux-pinning properties of Bi₂Sr₂CaCu₂O_(8+delta)/Ag (2212/Ag) tape conductors utilizing (Sr_(1-x)Ca_x)₁₄Cu₂₄O_(41+delta) and Sr₂CaAl₂O₆ defects are described. Precursor powders with composition (2212 + N% volume fraction Sr₁₀Ca₄Cu₂₄O_(41+delta); N = 0, 7, 15) were prepared by solid-state reaction to obtain subsolidus phase equilibrium at 860 deg C, as measured by X-ray diffraction (XRD). Nanophase (10 - 20 nm) Al₂O₃ was added (1.1% mass fraction) to N = 0 and 15 fully reacted powders. Brush-on coated tapes (13 - 17 micrometers 2212 thickness) were processed by a partial-melt growth method in air with variable melting from 865 deg C to 890 deg C, and slow-cool recrystallization from 856 deg C to 847 deg C. The effect of different melt temperatures and compositions on film properties (phase assemblages, orientations, and compositions, and defect sizes) was studied by XRD, scanning electron microscopy (SEM), and energy dispersive spectroscopy (EDS).

DTIC

Crystal Defects; Tapes; High Temperature Superconductors; Bismuth Compounds

20040010676 Princeton Univ., NJ

Scaling of Cross Sections for Ion-Atom Impact Ionization

Kaganovich, I.; Startsev, B.; Davidson, R.; Jun. 2003; 52 pp.; In English

Report No.(s): DE2003-814022; PPPL-3819; No Copyright; Avail: Department of Energy Information Bridge

The values of ion-atom ionization cross sections are frequently needed for many applications that utilize the propagation of fast ions through matter. When experimental data and theoretical calculations are not available, approximate formulas are frequently used. This paper briefly summarizes the most important theoretical results and approaches to cross section calculations in order to place the discussion in historical perspective and offer a concise introduction to the topic. Based on experimental data and theoretical predictions, a new fit for ionization cross sections is proposed. The range of validity and accuracy of several frequently used approximations (classical trajectory, the Born approximation, and so forth) are discussed using, as examples, the ionization cross sections of hydrogen and helium atoms by various fully stripped ions.

NTIS

Electron Impact; Ionization Cross Sections; Ion Impact

20040010679 General Atomics Co., San Diego, CA

Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy

Schultz, K. R.; Brown, L. C.; Besenbruch, G. E.; Hamilton, C. J.; Feb. 2003; 22 pp.; In English

Report No.(s): DE2003-814028; GA-A24265; No Copyright; Avail: Department of Energy Information Bridge

The 'Hydrogen Economy' will reduce petroleum imports and greenhouse gas emissions. However, current commercial hydrogen production processes use fossil fuels and releases carbon dioxide. Hydrogen produced from nuclear energy could avoid these concerns. The authors have recently completed a three-year project for the US Department of Energy whose objective was to 'define an economically feasible concept for production of hydrogen, by nuclear means, using an advanced high-temperature nuclear reactor as the energy source'. Thermochemical water-splitting, a chemical process that accomplishes the decomposition of water into hydrogen and oxygen, met this objective. The goal of the first phase of this study was to evaluate thermochemical processes which offer the potential for efficient, cost-effective, large-scale production of hydrogen and to select one for further detailed consideration. The authors selected the Sulfur-Iodine cycle. In the second phase, they reviewed all the basic reactor types for suitability to provide the high temperature heat needed by the selected thermochemical water splitting cycle and chose the helium gas-cooled reactor. In the third phase they designed the chemical flow-sheet for the thermochemical process and estimated the efficiency and cost of the process and the projected cost of producing hydrogen. These results are summarized in this paper.

NTIS

Hydrogen Production; Thermochemistry; Carbon Dioxide; Chemical Reactions; High Temperature Nuclear Reactors

20040010725 Oak Ridge National Lab., TN, USA, IIT Research Inst., Bartlesville, OK, USA

Characterization of Soluble Organic in Produced Water

Bostick, D. T.; Luo, H.; Hindmarsh, B.; Jan. 2002; 76 pp.; In English

Report No.(s): DE2003-814231; ORNL/TM-2001/78; No Copyright; Avail: Department of Energy Information Bridge

To determine the effect that various drilling conditions might have on water-soluble organics (WSO) content in produced water, a simulated brine water containing the principal inorganic components normally found in Gulf of Mexico (GOM) brine sources was prepared. The GOM simulant was then contacted with as-received crude oil from a deep well site to study the effects of water cut, produced-water pH, salinity, pressure, temperature, and crude oil sources on the type and content of the WSO in produced water. The identities of individual semivolatile organic compounds (SVOCs) were determined in all as-received crude and actual produced water samples using standard USEPA Method (8270C) protocol. These analyses were supplemented with the more general measurements of total petroleum hydrocarbon (TPH) content in the gas, diesel, and oil carbon ranges as determined by both gas chromatographic (GC) and infrared (IR) analyses. An open liquid chromatographic procedure was also used to differentiate the saturated hydrocarbon, aromatic hydrocarbon, and polar components within the extractable TPH. Inorganic constituents in the produced water were analyzed by ion-selective electrodes and inductively coupled plasma (ICP)-atomic emission spectrometry (AES).

NTIS

Alkanes; Organic Compounds; Atomic Spectra; Environment Protection; Water

20040010779 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD, USA

Hydrolysis of Levinstein Mustard (H)

Rohrbaugh, Dennis K.; Wagner, George W.; Sumpter, Kenneth B.; Harvey, Steven P.; Aug. 2003; 21 pp.; In English
Report No.(s): AD-A418867; ECBC-TR-336; No Copyright; Avail: CASI; [A03](#), Hardcopy

Samples of Levinstein mustard (H) were removed from leaking munitions. These samples were labeled 'liquid' and 'solid,' although both samples contained materials of both phases. The samples were analyzed by gas chromatography/mass spectrometry (GC/MS) and were found to contain HD as a minor component in both cases; The liquid sample was analyzed by ¹³C nuclear magnetic resonance (NMR) and was found to contain thiodiglycol as the single most abundant compound. Liquid and solid samples were hydrolyzed at a concentration of 15% H in water, with subsequent addition of an excess of NaOH. The hydrolysates were extracted with either chloroform, hexane, or cyclohexane and analyzed by GC/MS and in all cases were found to contain no HD at or above the drinking water level of 200 ppb. The GC/MS analysis of the solid sample showed a number of cyclic compounds not found in the liquid hydrolysate. In general, cyclohexane was found to be the preferred solvent for extraction because it provided a better NMR matrix than either hexane or chloroform and cleanly separated the extract from the large mass of high density solids on the bottom of the extract.

DTIC

Hydrolysis; Cyclic Compounds; Cyclohexane; Solvent Extraction

20040012614 Civil Aerospace Medical Inst., Oklahoma City, OK, USA, University of Central Oklahoma, Edmond, OK, USA

Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry

Lewis, Russell J.; Johnson, Robert D.; Angier, Michael K.; Ritter, Roxane M.; Drilling, Holly S.; Williams, Shyla D.; December 2003; 16 pp.; In English

Contract(s)/Grant(s): FAA-AM-B-03-TOX-204

Report No.(s): DOT/FAA/AM-03/23; No Copyright; Avail: CASI; [A03](#), Hardcopy

Cocaine (COC) is one of the most widely abused illicit drugs in America. COC abuse transcends all social, racial, and economic boundaries. It is available in two primary forms: COC hydrochloride, a white crystalline powder that can be snorted, swallowed, or injected, and crack, COC hydrochloride that has been processed into its freebase form through a reaction with either ammonia or bicarbonate. The presence of COC, its metabolites, pyrolysis products and/or ethanol adducts in biological fluids and tissues provide markers of COC use and its possible route of administration. The catabolism of COC results primarily in the ester hydrolysis products benzoylecgonine (BE) and, to a lesser extent, ecgonine methyl ester (EME). Described herein is a rapid, automated procedure for the single-step extraction and simultaneous determination of COC and its metabolites BE, NCOC, NBE, HBE, EME, and E, as well as the pyrolysis products AEME and AE and the ethanol adducts CE, NCE, and EEE in postmortem fluids and tissues using a Zymark RapidTrace™ solid-phase extraction (SPE) system and gas chromatography with mass spectrometry (GUMS).

Author (revised)

Drugs; Metabolites; Mass Spectroscopy; Gas Chromatography

20040012619 Louisiana State Univ., Baton Rouge, LA

Mixing and Combustion in Vortex Dominated Combustors with Distributed Air-and Fuel-Injection

Acharya, Sumanta; Murphy, Michael; Jan. 1998; 48 pp.; In English

Contract(s)/Grant(s): F49620-98-1-0476; Proj-3484

Report No.(s): AD-A419017; AFRL-SR-AR-TR-03-0479; No Copyright; Avail: CASI; [A03](#), Hardcopy

Measurements of temperature, velocity and emissions were performed in two trapped vortex combustor configurations, and several strategies for improving key performance metrics (e.g., circumferential uniformity in temperature and NOx emissions) were examined. The measurements show that introducing swirl with the primary cavity air reduces NOx emissions, extends the Lean Blow Out (LBO) limit and decreases circumferential non-uniformity in the temperature. With the inner-cavity configuration, LBO values as low as 0.1 and single-digit NOx were achieved. With the outer-cavity configuration, LBO occurred at 0.3. Computations performed indicate that the cavity vortex has a toroidal donut shape, and has large scale dynamics. Distributed micro-scale fuel injectors were fabricated as part of this effort, and have the potential for generating an uniform dispersion of small droplets desirable for improved combustion characteristic& Temperature-actuated bi-morph valves were also develop%ed for control of dilution air and local stoichiometry.

DTIC

Combustion; Combustion Temperature; Trapped Vortices; Combustion Chambers

20040012631 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry

Cardona, Patrick S.; Chaturvedi, Arvind K.; Soper, John W.; Canfield, Dennis V.; December 2003; 19 pp.; In English

Contract(s)/Grant(s): FAA-AM-B-98-TOX-202; FAA-AM-B-99-TOX-202; FAA-AM-B-00-TOX-202;

FAA-AM-B-01-TOX-202; FAA-AM-B-02-TOX-202; FAA-AM-B-03-TOX-202

Report No.(s): DOT/FAA/AM-03/24; No Copyright; Avail: CASI; [A03](#), Hardcopy

During the investigations of fatal transportation accidents, samples from victims are also analyzed for drugs, including cocaine (COC). COC is abused by smoking, nasal insumantion, and intravenous injection, and it is also taken with ethanol. Therefore, it is important to determine concentrations of COC and its metabolites, ethanol analogs, and pyrolysis products for establishing the degree of toxicity, the possible ingestion of ethanol, and the possible route of administration. In this study, a sensitive and selective procedure is developed for the simultaneous analyses of COC, benzoylecgonine, norbenzoylecgonine, norcocaine, ecgonine, ecgonine methyl cocaethylene, norcocaethylene, and ecgonine ethyl ester in blood, urine, and muscle homogenate. In the analysis, available deuterated analogs of these analytes were used as internal standards. Proteins from blood and muscle homogenate were precipitated with cold acetonitrile. After the removal of acetonitrile by evaporation, the supernatants and urine were extracted by solid-phase chromatography. The eluted analytes were converted to hydrochloride salts and derivatized with pentafluoropropionic anhydride and 2,2,3,3,3-pentafluoro-1-propanol. The derivatized products were analyzed on a gas chromatograph (GC)/mass spectrometer system by selected ion monitoring. This method was successfully applied in analyzing 13 case specimens from aviation accident pilot fatalities and/or motor vehicle operators. AEME concentrations found in the 13 specimens were consistent with those produced solely by the GC inlet pyrolysis of COC controls, suggesting that COC was not abused in these cases by smoking. Although AEME remains a potential marker for establishing the abuse of COC by smoking, AECG was not a useful marker because of its low recovery and GC inlet production from COC metabolites. The developed procedure is unique because multiple analytes can be analyzed in urine, blood, and solid tissues by a single extraction with increased sensitivity through formation of hydrochloride salts and using a one-step derivatization.

Author

Gas Chromatography; Mass Spectroscopy; Metabolites; Pyrolysis; Drugs; Narcotics; Toxicology

20040012634 Engineering Research and Consulting, Inc., Edwards AFB, CA, USA

The Specific Refractive Index Increment for Isobutyl Poss-Polystyrene Copolymers

Largo, Sherly R.; Haddad, Timothy S.; Gonzalez, Rene I.; Schlaefer, Constance; Jan. 2003; 4 pp.; In English

Report No.(s): AD-A419049; AFRL-PR-ED-TP-2003-290; No Copyright; Avail: CASI; [A01](#), Hardcopy

During recent years, there has been interest in incorporating polyhedral oligomeric silsesquioxanes (POSS) into many polymers. Due to its unique features, chemical composition and size, POSS can provide significant property enhancement to many plastics. POSS macromers, for instance, possess a hybrid inorganic-organic composition that can be tailored for incorporation into either thermoplastic or thermoset materials either by blending or by copolymerization. IsobutylPoSS-styrene& macromer, (C4H9)7Si8O12(C8H7), will undergo free radical polymerization with styrene to form random

copolymers. To obtain molecular weight data for POSS copolymers it would be useful to know the specific refractive index increment (dn/dc) for any particular copolymer system. We have now carefully measured the dn/dc values, for a series of styrene/isobutyl POSS-styrene random copolymers; a plot of dn/dc is linear with respect to weight % POSS monomer incorporated into the copolymer. The plot can be used to either determine the dn/dc of an unknown POSS-content copolymer, or the % POSS incorporation depending on which variable is not known. Furthermore, for different POSS macromers, it should be possible to just measure the dn/dc for the POSS homopolymer to generate the dn/dc values for all POSS weight %s in a particular copolymer system.

DTIC

Styrenes; Chemical Composition; Copolymerization; Butenes

20040012718 Eloret Corp., Moffett Field, CA, USA

Dissociative Ionization and Product Distributions of Benzene and Pyridine by Electron Impact

Dateo, Christopher E.; Huo, Winifred M.; Fletcher, Graham D.; [2003]; 1 pp.; In English; 56th Gaseous Electronics Conference, 21-24 Oct. 2003, San Francisco, CA, USA

Contract(s)/Grant(s): NAS2-00062; Copyright; Avail: Other Sources; Abstract Only

We report a theoretical study of the dissociative ionization (DI) and product distributions of benzene (C_6H_6) and pyridine (C_5H_5N) from their low-lying ionization channels. Our approach makes use of the fact that electronic motion is much faster than nuclear motion allowing DI to be treated as a two-step process. The first step is the electron-impact ionization resulting in an ion with the same nuclear geometry as the neutral molecule. In the second step, the nuclei relax from the initial geometry and undergo unimolecular dissociation. For the ionization process we use the improved binary-encounter dipole (iBED) model [W.M. Huo, Phys. Rev. A64,042719-1 (2001)]. For the unimolecular dissociation, we use multiconfigurational self-consistent field (MCSCF) methods to determine the steepest descent pathways to the possible product channels. More accurate methods are then used to obtain better energetics of the paths which are used to determine unimolecular dissociation probabilities and product distributions. Our analysis of the dissociation products and the thresholds of their productions for benzene are compared with the recent dissociative photoionization measurements of benzene by Feng et al. [R. Feng, G. Cooper, C.E. Brion, J. Electron Spectrosc. Relat. Phenom. 123,211 (2002)] and the dissociative photoionization measurements of pyridine by Tixier et al. [S. Tixier, G. Cooper, R. Feng, C.E. Brion, J. Electron Spectrosc. Relat. Phenom. 123,185 (2002)] using dipole ($e,e+ion$) coincidence spectroscopy.

Author

Benzene; Electron Impact; Ionization; Pyridines; Photodissociation

26

METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20040008559 Universal Energy Systems, Inc., Dayton, OH, USA

Development of Nickel Alloy Substrates for Y-Ba-Cu-O Coated Conductor Applications

Nekkanti, Rama M.; Seetharaman, Venkat; Brunke, Lyle; Maartense, Iman; Dempsey, Dave; Oct. 2003; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-98-D-2867; Proj-3145

Report No.(s): AD-A418688; AFRL-PR-WP-TP-2003-204; No Copyright; Avail: CASI; [A02](#), Hardcopy

Fabrication of long-length, textured substrates constitute a critical step in the successful application of coated high temperature superconductors (HTS). Substrate materials stronger than nickel are needed for robust applications, while substrates with non-magnetic characteristics are preferred for AC applications. The present work is thus focused on development of texture in high strength, non-magnetic substrate materials.

DTIC

Coatings; Nickel Alloys; High Temperature Superconductors

20040010337 California Univ., San Diego, CA, USA

Growth Induced Magnetic Anisotropy in Crystalline and Amorphous Thin Films

Hellman, F.; 2002; 16 pp.; In English

Report No.(s): DE2003-765083; No Copyright; Avail: Department of Energy Information Bridge

The work in the past 6 months has involved three areas of magnetic thin films: (1) amorphous rare earth-transition metal

alloys, (2) epitaxial Co-Pt and Ni-Pt alloy thin films, and (3) collaborative work on heat capacity measurements of magnetic thin films, including nanoparticles and CMR materials.

NTIS

Thin Films; Anisotropy; Nanoparticles; Magnetic Films; Crystallinity

20040010428 International Business Machines Corp., San Jose, CA, Northwestern Univ., Evanston, IL, USA

Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media

Baglin, J. E. E.; Sun, S.; Kellock, A. J.; Thomson, T.; Toney, M. F.; Jun. 2003; 12 pp.; In English

Report No.(s): DE2003-813281; SLAC-PUB-10025; No Copyright; Avail: Department of Energy Information Bridge

We describe the use of ion beam induced crosslinking to harden the organic matrix material of self-assembled arrays of monodisperse (4 nm) FePt nanoparticles, providing Diamondlike Carbon barriers to inhibit agglomeration of the nanoparticles under heat treatment. Such stabilization is necessary for the particles to survive the less than 500 degrees C annealing required for growth of the fat L10 phase of FePt, whose magnetic anisotropy is necessary for application of such arrays for high density perpendicular recording. Selective area irradiation of continuous nanoparticle coatings, using ion beams patterned over a full disk by stencil mask or with ion projection optics, followed by dissolution of the unexposed coating, is proposed as a means of fabricating extended bit patterns consisting of isolated 'islands' of FePt nanoparticles, with characteristic dimensions of tens of nanometers.

NTIS

Iron; Nanostructure (Characteristics); Magnetic Properties; Ion Beams; Nanoparticles; Magnetic Storage

20040010430

Controlled Synthesis and Assembly of FePt Nanoparticles

Sun, S.; 2003; 26 pp.; In English

Report No.(s): DE2003-813357; SLAC-PUB-9993; No Copyright; Avail: Department of Energy Information Bridge

Monodisperse 4 nm FePt magnetic nanoparticles were synthesized by superhydride reduction of FeCl₂ and Pt(acac)₃ at high temperature, and thin assemblies of FePt nanoparticles with controlled thickness were formed through polymer mediated self-assembly. Adding superhydride (LiBEt₃H) to the organic solution of FeCl₂ and Pt(acac)₃ in the presence of oleic acid, oleylamine and 1,2-hexadecanediol at 200 degrees C, followed by refluxing at 263 degrees C led to monodisperse 4 nm FePt nanoparticles. The initial molar ratio of the metal precursors was retained during the synthesis; and the final FePt composition of the particles was readily tuned. Alternatively absorbing a layer of polyethylenimine (PEI) and the FePt nanoparticles onto a solid substrate resulted in nanoparticle assemblies with tunable thickness. Chemical analysis of the assemblies revealed that more iron oxide was present in the thinner assemblies annealed at lower temperature or for shorter time. Thermal annealing induced the internal particle structure change from chemically disordered fcc to chemically ordered fct and transformed the thin assembly from superparamagnetic to ferromagnetic. This controlled synthesis and assembly can be used to fabricate FePt nanoparticle-based functional devices for future nanomagnetic applications.

NTIS

Nanoparticles; Synthesis (Chemistry); Nanostructure Growth

20040010433 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Lithium-Based Electrochromic Mirrors

Richardson, T. J.; Slack, J. L.; 2003; 14 pp.; In English

Report No.(s): DE2003-813390; No Copyright; Avail: Department of Energy Information Bridge

Antimony, antimony-copper, and antimony-silver thin films were prepared by DC magnetron sputtering on glass substrates. Their reflectance and transmittance in the visible range were measured before and after electrochemical lithiation. The mixed metal films exhibited larger changes in reflectance and small shifts in the optical absorption edge compared with pure antimony films. Electrochromic cycling speed and stability of the Sb-Li system were improved by the addition of copper and silver.

NTIS

Antimony; Absorption; Copper

20040010438 Oak Ridge National Lab., TN, USA

Examination of Compatibility of Cavitation-Resistance Modifications to Type 316LN Stainless Steel in a Mercury Thermal Convection Loop

Pawel, S. J.; Manneschildt, E. T.; Sep. 2002; 38 pp.; In English

Report No.(s): DE2003-814312; ORNL/TM-2002/169; No Copyright; Avail: Department of Energy Information Bridge

A 316L stainless steel thermal convection loop (TCL) containing a variety of stainless steel coupons circulated mercury for 2000 h. The TCL conditions included a maximum temperature of 307C, a maximum temperature gradient of 90 degrees C, and a Hg velocity of about 1.4 m/min. In addition to mill-annealed/surface-ground 316LN coupons serving as the baseline material, other coupons included 316LN that was 50% cold-worked, 316LN that was given a proprietary surface hardening treatment termed kolsterizing, and Nitronic 60. The purpose of this test was to examine Hg compatibility with these modest variations of annealed 316LN stainless steel that are considered potential improvements over annealed 316LN for cavitation-erosion resistance in the Spallation Neutron Source (SNS) target containment system. The results indicated negligible weight change for each coupon type, no significant indication of attack or surface roughening, and generally no interaction with Hg.

NTIS

Stainless Steels; Corrosion Resistance

20040010498 Mississippi State Univ., Mississippi State, MS, USA

Effect of Applied Pressure During Feeding of Critical Cast Aluminum Alloy Components with Particular Reference to Fatigue Resistance

Berry, J. T.; Luck, R.; Zhang, B.; Taylor, R. P.; Jun. 2003; In English

Report No.(s): DE2003-813487; No Copyright; Avail: National Technical Information Service (NTIS)

The medium to long freezing range alloys of aluminum such as A356, A357, A206, 319 for example are known to exhibit dispersed porosity, which is recognized as a factor affecting ductility, fracture toughness, and fatigue resistance of light alloy castings. The local thermal environment, for example, temperature gradient and freezing from velocity, affect the mode of solidification which, along with alloy composition, heat treatment, oxide film occlusion, hydrogen content, and the extent to which the alloy contracts on solidification, combine to exert strong effects on the porosity formation in such alloys. In addition to such factors, the availability of liquid metal and its ability to flow through the partially solidified casting, which will be affected by the pressure in the liquid metal, must also be considered. The supply of molten metal will thus be controlled by the volume of the riser available for feeding the particular casting location, its solidification time, and its location together with any external pressure that might be applied at the riser.

NTIS

Aluminum Alloys; Fracture Strength

20040010509 Michigan Univ., Ann Arbor, MI, USA

Isolation of Microstructure in Proton-Irradiated Steels

Was, G. S.; Atzmon, M.; Wang, L.; Sep. 2000; 32 pp.; In English

Report No.(s): DE2003-766528; No Copyright; Avail: Department of Energy Information Bridge

Component degradation by irradiation is a primary concern in both current reactor systems as well as advanced designs and concepts where the demand for higher efficiency and performance will be considerably greater. In advanced reactor systems, core components will be expected to operate under increasingly hostile (temperature, pressure, radiation flux, dose, etc.) conditions. The current strategy for assessing radiation effects for the development of new materials is impractical in that the costs and time required to conduct reactor irradiations are becoming increasingly prohibitive, and the facilities for conducting these irradiations are becoming increasingly scarce. The next generation reactor designs will require more extreme conditions (temperature, flux, fluence), yet the capability for conducting irradiations for materials development and assessment in the next 20 years is significantly weaker than over the past 20 years. Short of building new test reactors, what is needed now are advanced tools and capabilities for studying radiation damage in materials that can keep pace with design development requirements. The most successful of these irradiation tools has been high energy (several MeV) proton irradiation. Proton irradiation to several tens of dpa can be conducted in short amounts of time (weeks), with relatively inexpensive accelerators, and result in negligible residual radioactivity.

NTIS

Proton Irradiation; Microstructure; Nuclear Reactors

20040010644 Army Research Lab., Aberdeen Proving Ground, MD

HVOF Application of Nickel and Nickel Alloy to Tungsten Heavy Alloy for Jacketed Penetrators

Kelley, John V.; Kilbane, Russell; Nov. 2003; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD17-01-P-0066

Report No.(s): AD-A418809; ARL-TR-3095; No Copyright; Avail: CASI; A03, Hardcopy

In recent years, there has been an increased desire to replace depleted uranium (DU) anti-armor penetrators with tungsten heavy alloy (WHA) penetrators. However, the ballistic performance of WHA does not compare with that of DU. Many methods of improving the ballistic properties of tungsten have been explored. One recent method includes jacketing a long thin core of WHA with a more ductile metal. This report examines the use of thermal-sprayed, high-velocity oxy-fuel coatings to apply the jacket material. However, applying thermal-sprayed coatings onto a tungsten substrate is a challenge. The differences in the coefficients of thermal expansion (CTE) make it difficult to achieve adequate adhesion of most coatings to tungsten. Further compounding the problem are residual stresses inherent in thermally sprayed coatings. The thicker the coating desired, the more likely disbonding will occur upon cooling of the substrate. Early attempts to apply an Ni coating (0.010 in thick) to a tungsten substrate yielded immediate disbonding and/or cracking of the coatings. The work presented is an investigation focusing on modifications to spray parameters and the use of multiple thin layers to minimize heat transfer and achieve better adhesion. The use of a material with a CTE nearer to that of tungsten as a bond coat and grading of coating materials was also examined as a method for increasing the overall adhesion of the coating system.

DTIC

Tungsten Alloys; Nickel Alloys; Chromates; Heat Transfer

20040010649 Army Research Lab., Aberdeen Proving Ground, MD

Analysis of the Noneroding Penetration of Tungsten Alloy Long Rods into Aluminum Targets

Segletes, Steven B.; Sep. 2003; 42 pp.; In English

Report No.(s): AD-A418829; ARL-TR-3075; No Copyright; Avail: CASI; [A03](#), Hardcopy

Data concerning the rigid/eroding-rod threshold transition are reported for hemispherical-nosed tungsten rods penetrating into thick 5083-aluminum targets. Presented data quantitatively buttress existing explanations. The current analysis suggests that the penetrator must bring to bear a different 'apparent' strength in the noneroding- vs. the eroding-penetration regimes. Conventional one-dimensional penetration analysis reveals that the noneroding datum is wholly consistent with the notion of treating the rod as if it penetrated in a rigid-body fashion, possessing unrealistically high yield strength. Study of a recovered rod fragment reveals that the penetrating rod nonetheless deformed, but did so without erosion. Such an observation for hemispherical-nosed rods is consistent with past qualitative explanations posited for ogival-nosed rods. The phenomenon, supported by analysis, is that an exaggerated stress was axially applied by the rod to the target interface, composed of both the rod's intrinsic yield strength plus a confining stress caused by a lateral interference fit between the rod and target during the penetration event.

DTIC

Tungsten Alloys; Yield Strength

20040010691 Oak Ridge National Lab., TN

Screening Test Results of Fatigue Properties of Type 316LN Stainless Steel in Mercury

Pawel, S. J.; DiStefano, J. R.; Strizak, J. P.; Stevens, C. O.; Mannes Schmidt, E. T.; Mar. 1999; 34 pp.; In English

Report No.(s): DE2003-814357; ORNL/TM-13759; No Copyright; Avail: Department of Energy Information Bridge

Fully reversed, load-controlled uniaxial push-pull fatigue tests at room temperature have been performed in air and in mercury on specimens of type 316LN stainless steel. The results indicate a significant influence of mercury on fatigue properties. Compared to specimens tested in air, specimens tested in mercury had reproducibility shorter fatigue lives (by a factor of 2-3), and fracture faces exhibiting intergranular cracking. Preliminary indications are that crack initiation in each environment is similar, but mercury significantly accelerates crack propagation.

NTIS

Fatigue Tests; Stainless Steels; Mercury (Metal)

20040010718 Oak Ridge National Lab., TN

Heavy Section Steel Irradiation Program Monthly Letter Status Report for March 2001

Rosseel, T. M.; Godfrey, R. D.; Fairbanks, C. J.; Mar. 2001; 44 pp.; In English

Report No.(s): DE2003-814117; ORNL/HSSI(6953)/MLSR-2001/6; No Copyright; Avail: Department of Energy Information Bridge

The primary goal of the Heavy-Section Steel Irradiation (HSSI) Program is to provide a thorough, quantitative assessment of the effects of neutron irradiation on the material behavior, and in particular the fracture toughness properties, of typical pressure vessel steels as they relate to light-water reactor pressure vessel (RPV) integrity. The program includes studies of the effects of irradiation on the degradation of mechanical and fracture properties of vessel materials augmented by enhanced

examinations and modeling of the accompanying microstructural changes. Effects of specimen size; material chemistry; product form and microstructure; irradiation fluence, flux, temperature, and spectrum; and post-irradiation mitigation are being examined on a wide range of fracture properties. This program will also maintain and upgrade computerized databases, calculational procedures, and standards relating to RPV fluence-spectra determinations and embrittlement assessments. Results from the HSSI studies will be incorporated into codes and standards directly applicable to resolving major regulatory issues that involve RPV irradiation embrittlement such as pressurized-thermal shock, operating pressure-temperature limits, low-temperature overpressurization, and the specialized problems associated with low upper-shelf welds. Six technical tasks and one for program management are now contained in the HSSI Program.

NTIS

Steels; Irradiation; Pressure Vessels; Toughness

20040010776 NASA Marshall Space Flight Center, Huntsville, AL, USA

Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids

Lee, G. W.; Gangopadhyay, A. K.; Kelton, K. F.; Hyers, R. W.; Rathz, T. J.; Rogers, J. R.; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

New short-range order data are presented for equilibrium and undercooled liquids of Ti and Ni. These were obtained from in-situ synchrotron x-ray diffraction measurements of electrostatically-levitated droplets. While the short-range order of liquid Ni is icosahedral, consistent with Frank's hypothesis, significantly distorted icosahedral order is observed in liquid Ti. This is the first experimental observation of distorted icosahedral short-range order in any liquid, although this has been predicted by theoretical studies on atomic clusters.

Author

Liquid Metals; Synchrotrons; Transition Metals; Electrostatics

20040012599 NASA Marshall Space Flight Center, Huntsville, AL, USA

A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid

Lee, G. W.; Gangopadhyay, A. K.; Kelton, K. F.; Hyers, R. W.; Rathz, T. J.; Rogers, J. R.; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

If crystallization can be avoided, liquids enter a metastable (undercooled) state below their equilibrium liquidus temperatures, T_l , finally freezing into a glass below a characteristic temperature called the glass transition temperature, T_g . In rare cases, the undercooled liquid may undergo a liquid-liquid phase transition (liquid polymorphism) before entering the glassy state. This has been suggested from experimental studies of H_2O and Si_4 . Such phase transitions have been predicted in some stable liquids, i.e. above T_l at atmospheric pressure, for SiO_2 and BeF_2 , but these have not been verified experimentally. They have been observed in liquids of P_7 , Sis and C_9 , but only under high pressure. All of these transitions are driven by an anomalous density change, i.e. change in local structure, with temperature or pressure. In this letter we present the first experimental evidence for a phase transition in a low viscosity liquid that is not driven by an anomalous density change, but by an approach to a constant configuration state. A maximum in the specific heat at constant pressure, similar to what is normally observed near T_g , is reported here for undercooled low viscosity liquids of quasicrystal-forming Ti-Zr-Ni alloys. that includes cooperativity, by incorporating a temperature dependent excitation energy fits the data well, signaling a phase transition.

Author

Phase Transformations; Titanium Alloys; Nickel Alloys; Zirconium Alloys

20040012646 Massachusetts Univ., Amherst, MA, USA

Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys

Hyers, R. W.; Bradshaw, R. C.; Rogers, J. R.; Rathz, T. J.; Lee, G. W.; Kelton, K. F.; Gangopadhyay, A. K.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

The surface tension and viscosity of quasicrystal-forming Ti-Zr-Ni alloys were measured over a range of temperature, including both stable and undercooled liquids by an Electrostatic Levitation (ESL) technique. ESL is a containerless technique which allows processing of samples without contact, greatly reducing contamination and increasing access to the metastable undercooled liquid. The measured viscosity is typical of glass-forming alloys of similar composition to the quasicrystal-forming alloys studied here, while the surface tension shows an anomaly at deep undercoolings.

Author

Titanium Alloys; Nickel Alloys; Zirconium Alloys; Interfacial Tension; Viscosity

20040012653 NASA Marshall Space Flight Center, Huntsville, AL, USA

Analysis of Radial Segregation in Directionally Solidified Hg(0.89)Mn(0.11)Te

Price, M. W.; Scripa, R. N.; Szofran, F. R.; Motakef, S.; Hanson, B.; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Bridgman growth experiments were performed on Hg(0.89)Mn(0.11)Te (MMT) to determine the extent of radial Manganese segregation during directional solidification. MMT crystals were directionally solidified at rates of 0.09 and 0.18 p d s and in axial thermal gradients of 83 and 68°C/cm. Wavelength Dispersive Spectroscopy (WDS) and Fourier Transform Infra-Red (FTIR) analytical techniques were used to determine the radial homogeneity in all boules and the deflection of the solid-liquid interface (SLI) in two boules that were rapidly quenched after 5 to 6 cm of directional solidification. For all growth runs, the measured radial compositional variations were on the order of 0.01 molar percent MnTe in the steady state region of growth. Comparison of the measured radial compositional results of the crystals to predicted values in the diffusion-limited regime indicate a strong influence of convection near the solid-liquid interface. This conclusion is supported by the weak influence of the translation rates and axial thermal gradients utilized in this study upon radial compositional homogeneity.

Author

Directional Solidification (Crystals); Bridgman Method

20040012897 Swedish Inst. for Metals Research, Stockholm, Sweden

Antimicrobial Surface Treatments of Aluminium in Air Conditioning Systems

Jedenmalm, A.; 2002; In English

Report No.(s): PB2004-100962; IM-2002-037; Copyright; Avail: National Technical Information Service (NTIS)

The purpose of the present report is mainly to create a database of information about antimicrobial coating: what they are, why they are needed, and which factors to consider when choosing one. A specific problem that has been treated is antimicrobial surface treatments of evaporators in cars' air conditioning systems in order to avoid bad odor arising from viable microorganisms. The main method used in the report is a literature survey, in order to enable the report to be a base for future projects. The report subject was also presented at three different seminars at SIMR in order to receive feedback from the Swedish industry. These methods lay the foundation of the necessary background-information needed for the selection of antimicrobial surface treatments, knowledge about how to make them, and for the selection of suitable test methods. The application methods used were anodizing of aluminum as well as dipping in a polymer solution with an antimicrobial agent. The thickness of the coatings was estimated by using surface carbon analysis, and the wetting properties were estimated by measuring the contact angle with a tensiometer. The evaluation of the antimicrobial properties was done by two microbiological test methods: one with bacteria, and one with fungi.

NTIS

Aluminum; Microorganisms; Air Conditioning; Surface Treatment

20040012943 NASA Langley Research Center, Hampton, VA, USA

Development of Oxidation Protection Coatings for Gamma Titanium Aluminide Alloys

Wallace, T. A.; Bird, R. K.; Sankaran, S. N.; December 16, 2003; 10 pp.; In English; JANNAF 39th Combustion Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA

Contract(s)/Grant(s): NASA Order L-71753-D; No Copyright; Avail: CASI; A02, Hardcopy

Metallic material systems play a key role in meeting the stringent weight and durability requirements for reusable launch vehicle (RLV) airframe hot structures. Gamma titanium aluminides (gamma-TiAl) have been identified as high-payoff materials for high-temperature applications. The low density and good elevated temperature mechanical properties of gamma-TiAl alloys make them attractive candidates for durable lightweight hot structure and thermal protection systems at temperatures as high as 871 C. However, oxidation significantly degrades gamma-TiAl alloys under the high-temperature service conditions associated with the RLV operating environment. This paper discusses ongoing efforts at NASA Langley Research Center to develop durable ultrathin coatings for protecting gamma-TiAl alloys from high-temperature oxidation environments. In addition to offering oxidation protection, these multifunctional coatings are being engineered to provide thermal control features to help minimize heat input into the hot structures. This paper describes the coating development effort and discusses the effects of long-term high-temperature exposures on the microstructure of coated and uncoated gamma-TiAl alloys. The alloy of primary consideration was the Plansee alloy gamma-Met, but limited studies of the newer alloy gamma-Met-PX were also included. The oxidation behavior of the uncoated materials was evaluated over the temperature range of 704 C to 871 C. Sol-gel-based coatings were applied to the gamma-TiAl samples by dipping and spraying, and the

performance evaluated at 871 C. Results showed that the coatings improve the oxidation resistance, but that further development is necessary.

Author

Titanium Aluminides; Protective Coatings; Thermal Protection; Corrosion Prevention

27

NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

20040008918 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

S-Shaped Magnetic Macroparticle Filter for Cathodic ARC Deposition

Anders, S.; Anders, A.; Dickinson, M. R.; MacGill, R. A.; Brown, I. G.; Apr. 1996; 14 pp.; In English

Report No.(s): DE2003-409856; LBL-37949; No Copyright; Avail: Department of Energy Information Bridge

A new magnetic macroparticle filter design consisting of two 90 degree filters forming an S-shape is described. The transport properties of this S-filter are investigated using Langmuir and deposition probes. It is shown that the filter efficiency is the product of the efficiencies of two 90 degrees filters and the deposition rate is still acceptability high to perform thin film deposition. Films of amorphous hard carbon have been deposited using a 90 degree filter and the S-filter, and the macroparticle content of the films are compared.

NTIS

Amorphous Materials; Electrostatic Probes; Electromagnetic Wave Filters

20040010496 Boeing Co., Seattle, WA, USA

Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0004: Advanced Sol-Gel Adhesion Processes

Blohowiak, Kay Y.; Anderson, Robert A.; Stephenson, Ronald R.; Preedy, Kristina S.; Apr. 2002; 76 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-00-D-3052; Proj-2401

Report No.(s): AD-A419183; AFRL-ML-WP-TR-2003-4173; No Copyright; Avail: CASI; [A05](#), Hardcopy

This report summarizes optimization work for surface preparations and hybrid primers utilizing sol-gel technology on metal alloy substrates. The project focuses on the development and optimization of user-friendly sol-gel methods for preparing metal surfaces for bonding with 250 degrees F-cure and 350 degrees F-cure epoxy adhesives. Several improvements to the Boegel-EPII materials and processes were identified in this work. For example, addition of a surfactant can improve the appearance and uniformity of the sol-gel coatings, but is not critical for achieving good performance on these alloys. Studies indicate that careful choice of abrasive media and tools is required to achieve reproducible performance for the surface preparation of aluminum alloys. Under carefully controlled laboratory conditions, it is possible to yield good performance for many of the abrasive media, but when subjected to conditions that mimic a repair scenario, only a few of the abrasive media gave reproducible performance. Surface contamination on the metal was a result of smeared adhesive, overheating of the abrasive pad or tool, or unacceptable cleaning of the surface. Performance using downselected abrasive media and tools was verified using hot/wet testing, such as the wedge test and double cantilever beam testing. Procedures were documented specifying all of the preferred materials and processes.

DTIC

Adhesion; Sol-Gel Processes; Aluminum Alloys; Technology Utilization

20040010515 California Inst. of Tech., Pasadena, CA

Ceramic Membranes for Hydrogen Production from Coal

Gavalas, G. R.; 2003; 28 pp.; In English

Report No.(s): DE2003-813617; No Copyright; Avail: Department of Energy Information Bridge

The present project is devoted to developing hydrogen permselective silica membranes supported on composite supports to achieve high flux and selectivity. The supports consist of a thin zeolite silicalite layer coated on $(\alpha)\text{-Al}(\text{sub } 2)\text{O}(\text{sub } 3)$ tubes of mean pore size 1(micro)m. The zeolite layer is grown by reaction in a suitable silicate solution at 95 C. After two or three reaction periods a layer of silicalite crystals about 20(micro)m thick grows inside the pores of alumina. In addition to the zeolitic pores, this layer contains voids of a few nanometer diameter that remain between the crystals or between the crystals and the pore walls. The quality of the silicalite/alumina composites was evaluated by gas permeation measurements

and by nitrogen adsorption and it was found that the residual voids were below 5 nm in diameter. Three techniques were investigated for chemical vapor deposition (CVD) of the silica layer on the silicalite/alumina composite support. The first was TEOS pyrolysis at approximately one millibar partial pressure and 650 C. The second CVD technique investigated was SiCl(sub 4) hydrolysis at 90 C. In the third technique investigated, silica deposition was carried out by SiCl(sub 4) hydrolysis at 400 C, again in a sequence of half reaction cycles. After 15 cycles the membrane pores were well sealed by a layer stable to at least 400 C.

NTIS

Hydrogen Production; Permeability

20040010692 North Carolina State Univ., Raleigh, NC, USA, Oak Ridge National Lab., TN, USA

Cylindrical Wire Electrical Discharge Machining of Metal Bond Diamond Wheels Part II: Wheel Wear Mechanism

Rhoney, B. K.; Shih, A. J.; Scattergood, R. O.; Ott, R.; McSpadden, S. B.; 2003; 22 pp.; In English

Report No.(s): DE2003-814385; No Copyright; Avail: Department of Energy Information Bridge

The use of stereo scanning Electron Microscopy (SEM) to investigate the wear mechanism of the wire EDM true metal bond diamond wheel for ceramic grinding is presented. On the grinding wheel, a wedge-shape removal part was machined to enable the examination and measurement of the worn wheel surfaces using the stereo SEM. The stereo SEM was calibrated by comparing results of depth profile of a wear groove with the profilometer measurements. On the surface of the grinding wheel after wire EDM truing and before grinding, the diamond protruding heights were measured in the level of 35(micro)m, comparing to the 54(micro)m average size of the diamond in the grinding wheel. The gap between the EDM wire and rotating grinding wheel is estimated to be about 35 to 40(micro)m. This observation indicates that, during the wire EDM, electrical sparks occur between the metal bond and EDM wire, which leaves the diamond protruding in the gap between the wire and wheel. The protruding diamond is immediately fractured at the start of the grinding process, even under a light grinding condition. After heavy grinding, the grinding wheel surface and the diamond protrusion heights are also investigated using the stereo SEM. The height of diamond protrusion was estimated in the 5 to 15(micro)m range. This study has demonstrated the use of stereo SEM as a metrology tool to study the grinding wheel surface.

NTIS

Cylindrical Bodies; Scanning Electron Microscopy; Diamonds

20040012575 California Univ., Santa Barbara, CA

Charge Transfer Polymers as Ultrafast Holographic Materials

Heeger, Alan J.; Jan. 1999; 11 pp.; In English

Contract(s)/Grant(s): F49620-99-1-0031; Proj-2303

Report No.(s): AD-A419003; AFRL-SR-AR-TR-03-0495; No Copyright; Avail: CASI; [A03](#), Hardcopy

A summary of the significant scientific accomplishments that resulted from research supported under AFOSR F49620-99-1-0031 is included in this Final Technical Report with emphasis on the following specific areas: (i) Time Resolve Forster Energy Transfer in Polymer Blends (ii) Ultrafast Detection of Charged Photocarriers in Conjugated Polymers (iii) Photophysics of poly(2,3-diphenyl-5-hexyl- phenylene vinylene (iv) Singlet Exciton Binding Energy in Poly(phenylene vinylene) (v) Excitation Spectrum for Ultrafast Photogeneration of Charged Solitons in Polyacetylene (vi) Optical Investigation of intra- and interchain charge dynamics in metallic polymers (vii) High Efficiency Polymer-based Electrophosphorent Devices

DTIC

Polymers; Charge Transfer

20040012608 Massachusetts Inst. of Tech., Cambridge, MA

Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nano-composites

Boyce, Mary C.; McKinley, G.; Parks, D. M.; Thomas, E. L.; Cohen, R. E.; Gleason, K.; Rutledge, G.; Brittain, W. J.; Jan. 2001; 10 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0405

Report No.(s): AD-A419013; AFRL-SR-AR-TR-03-0494; No Copyright; Avail: CASI; [A02](#), Hardcopy

This report details the acquisition of instrumentation to support fundamental research focused on studying the relationships between microstructure, processing and macroscopic properties of polymeric based nanocomposites having reinforcing particles with 0, 1 and 2 dimensional shapes. A close coupling between experimental observations and

computational modeling & analysis is essential to develop the understanding needed to take nanocomposite technologies forward. The equipment is being utilized to establish a fundamental knowledge base of the structure -property- processing relations for a wide spectrum of nanocomposite types. Controlled blending of inorganic fillers of a range of morphologies - equiaxial (carbon black, silica); tubular: (carbon nanotubes) or discotic (nano-clay) - into a range of polymeric matrices (semicrystalline, glassy, thermoplastic- elastomer and elastomeric) provides exploration of filler/matrix combinations with a wide range of chemical and physical attributes. The huge surface/volume ratio and the small inter-particle spacings create an unusual situation in which nearly every polymer molecule is interacting with a nearby filler interface.

DTIC

Mechanical Properties; Polymers

20040012930 NASA Langley Research Center, Hampton, VA, USA

Spectroscopy-Based Characterization of Single Wall Carbon Nanotubes

Namkung, Min; Namkung, Juock S.; Wincheski, Russell A.; Seo, J.; Park, Cheol; October 23, 2003; 6 pp.; In English; International Symposium on Clusters and Nano-Assemblies: Physical and Biological Systems, 10-13 Nov. 2003, Richmond, VA, USA

Contract(s)/Grant(s): 23-706-61-11; No Copyright; Avail: CASI; [A02](#), Hardcopy

We present the initial results of our combined investigation of Raman scattering and optical absorption spectroscopy in a batch of single wall carbon nanotubes (SWNTs). The SWNT diameters are first estimated from the four radial breathing mode (RBM) peaks using a simple relation of $\omega(\text{sub RBM}) = 248/\text{cm nm}/d(\text{sub t})(\text{nm})$. The calculated diameter values are related to the optical absorption peaks through the expressions of first interband transition energies, i.e., $E(\text{sup S})(\text{sub 11}) = 2a \gamma/d(\text{sub t})$ for semiconducting and $E(\text{sup S})(\text{sub 11}) = 6a \gamma/d(\text{sub t})$ for metallic SWNTs, respectively, where a is the carbon-carbon bond length (0.144 nm) and γ is the energy of overlapping electrons from nearest neighbor atoms, which is 2.9 eV for a SWNT. This analysis indicates that three RBM peaks are from semiconducting tubes, and the remaining one is from metallic tubes. The detailed analysis in the present study is focused on these three peaks of the first absorption band by determining the values of the representative (n,m) pairs. The first step of analysis is to construct a list of possible (n,m) pairs from the diameters calculated from the positions of the RBM peaks. The second step is to compute the first interband transition energy, $E(\text{sub 11})$, by substituting the constructed list of (n,m) into the expression of Reich and Thomsen, and Saito et al. Finally, the pairs with the energies closest to the experimental values are selected.

Author

Carbon Nanotubes; Raman Spectra; Absorption Spectroscopy

28

PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power*; *20 Spacecraft Propulsion and Power*; and *44 Energy Production and Conversion*.

20040010698 Swedish Defence Research Establishment, Tumba

Ageing Control Number 3 of Propellants for Rocket Motors RB 75 Maverick

Pettersson, A.; Eiderfors, B.; Aug. 2002; In Swedish

Report No.(s): PB2004-101606; FOI-R-0495-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the analysis of the rocket motor grain and the rocket igniter assembly. This is the third consecutive test concerning the state of RB 75 rocket motor grain, and the first on the rocket motor igniter, performed at FOI. The following tests have been performed: The rocket grain: tensile strength, insulation adhesion, glass transition temperature and propellant hardness; The rocket igniter: microcalorimetric investigation, electrical resistance measurement, components have been ocularly inspected and photographed. The strain tests of the propellant grain show a somewhat peculiar behavior regarding ultimate strain as function of temperature. This is however in accordance with previous test results.

NTIS

Composite Propellants; Rocket Engines; Aging (Materials)

20040010837 NASA Marshall Space Flight Center, Huntsville, AL, USA

Isothermal Microcalorimetric Evaluation of Compatibility of Proposed Injector Materials with High-Test Hydrogen Peroxide Propellant

Gostowski, Rudy; [2003]; 5 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; [A01](#), Hardcopy

High-test hydrogen peroxide (HTP) is receiving renewed interest as a monopropellant and as the oxidizer for bipropellant systems. HTP is hydrogen peroxide in concentrations ranging from 70 to 98%. All surfaces wetted by HTP must be evaluated for compatibility with the fluid. In the case of tanks, lines and valves compatibility is required to preserve the HTP oxygen and energy content and to avoid overpressurization due to decomposition. With injectors and regenerative cooling passages shorter exposure time reduces these concerns. However, phase changes from fluid to gas impact heat transfer and become the dominant compatibility concern. Isothermal microcalorimetry (IMC) provides a convenient and reproducible means to observe the decomposition of HTP when exposed to structural materials and therefore the compatibility of those materials'. The instrument provides heat flow values in terms of watts that may be converted to a reaction rate given the heat of reaction for the decomposition of hydrogen peroxide. These values are then converted to percent active oxygen loss per week (%AOL/wk) to preserve an earlier convention for quantifying HTP compatibility. Additionally, qualitative designations of compatibility have been assigned to these values. This scheme consists of four classes with Class 1 being the most compatible. While historical compatibility data is available its current applicability is in question due to subtle changes in the compositions of both HTP and structural materials. Trace levels of molecules can have significant influence on compatibility. Therefore representative samples of materials must be evaluated with current HTP formulations. In this work seven materials were selected for their strength characteristics at high temperature as expected in a HTP injector. The materials were then evaluated by IMC for HTP compatibility.

Derived from text

Calorimeters; Hydrogen Peroxide; Injectors; Liquid Rocket Propellants; Isothermal Processes

20040010867 Parsons Engineering Science, Inc., GA, USA

Handbook for Remediation of Petroleum-Contaminated Sites (A Risk-Based Strategy)

Apr. 1998; 286 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418936; No Copyright; Avail: CASI; [A13](#), Hardcopy

The Air Force is responsible for thousands of sites throughout the USA and abroad that are contaminated with petroleum hydrocarbons such as jet fuel, diesel fuel, gasoline, and heating oil. Despite significant improvements in fuels management over the past 20 years, equipment failures and human error will continue to create new spills which may require remediation. The purpose of this handbook is to provide Air Force environmental managers and their supporting technical specialists with a comprehensive strategy for cost-effectively cleaning up soils and groundwater contaminated by petroleum releases. The original Air Force Handbook for Remediation of Petroleum Contaminated Sites, which was published in 1993, has been updated to include the most recent advances in site investigation techniques and remedial approaches and technologies. In addition, since publication of the 1993 handbook, positive regulatory changes have taken place as the USA Environmental Protection Agency (USEPA) and a majority of state regulatory agencies have adopted more flexible, risk-based regulations for petroleum release sites. In addition, many states now recognize natural attenuation as a viable treatment alternative for petroleum-contaminated groundwater. These regulatory changes have had significant impacts on the remediation process, and have been fully incorporated into this new handbook.

DTIC

Ground Water; Fuel Tanks; Fuel Contamination

31

ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

20040008842 Alabama Univ., Huntsville, AL, USA

Instrument for Measuring Cryo CTE

Vikram, Chandra S.; Hadaway, James B.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Coefficient of thermal expansion is an integral part of the performance of optical systems, especially for those, which operate at cryogenic temperatures. The measurement of the coefficient of relevant materials has been of continuous interest. Besides commercial measurement sources, development of one-of-a-kind tools have always been of interest due to local needs. This paper describes one such development at the University of Alabama in Huntsville (UAH). The approach involves two vertical rods (one sample and one reference) on a flat platform. A probe bar is held horizontally atop the two samples. A temperature change will generally cause rotation of the probe bar. A mirrored surface on one end of the probe bar is used to measure the rotation using the reflection of an incident laser beam upon it. A position-sensing detector measures the change

of the reflected beam spot position. Using other known quantities, the change determines the coefficient of thermal expansion of the sample material as a function of temperature. A parallel measurement of the rotation of the sample support platform is also performed to account for any unwanted background effects. This system has been demonstrated in a cryogenic chamber at the NASA Marshall Space Flight Center X-ray Calibration Facility (XRCF). We present the system details, achievable sensitivity, and up-to-date experimental performance.

Author

Thermal Expansion; Cryogenic Temperature

20040010479, Duke Univ., Durham, NC, USA

Radiation Protection at High-Energy Electron Accelerators

Vylet, V.; Liu, J. C.; Oct. 2002; 30 pp.; In English

Report No.(s): DE2003-812597; SLAC-PUB-9557; No Copyright; Avail: Department of Energy Information Bridge

This work presents an overview of radiation protection at high-energy electron accelerator facilities. By 'high-energy' we mean the energy domain beyond few tens of MeV, where electromagnetic showers are the determining and dominant factor in beam interactions with matter. We describe basic components of electron accelerators and their potential impact on radiation safety. We then concentrate mainly on sources of prompt radiation which distinguish these machines from other accelerator facilities. In other areas we only mention details relevant to electron machines. More comprehensive description of these aspects, such as shielding or safety systems, can be found elsewhere in this issue. General concepts presented in this review are complemented and illustrated by more specific examples in our follow-up work in this issue.

NTIS

Shielding; Radiation Protection; Electron Accelerators

20040010643 Naval Research Lab., Bay Saint Louis, MS

Mean COAMPS Air-Sea Fluxes Over the Mediterranean During 1999

Martin, Paul J.; Hodur, Richard M.; Sep. 18, 2003; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418788; NRL/FR/7322--03-10045; No Copyright; Avail: CASI; [A03](#), Hardcopy

Temporally and spatially averaged air-sea fluxes for the Mediterranean Sea were computed from surface fields output by COAMPS reanalyses conducted for the year 1999. The COAMPS air-sea fluxes were computed by May (1986) from GOADS observations and with some other estimates.

DTIC

Ocean Models; Heat Flux

20040010782 Pennsylvania State Univ., University Park, PA

Instrumentation and Equipment Upgrades to Improve Acoustical and Fluid Dynamic Measurements in the Garfield Thomas Water Tunnel

Marboe, R. C.; Fontaine, A. A.; Cawley, T.; Oct. 2003; 43 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-01-1-0311

Report No.(s): AD-A418897; ARL/PSU/TR-03-009; No Copyright; Avail: CASI; [A03](#), Hardcopy

The overall objective of the project was to plan and implement the necessary Garfield Thomas Water Tunnel mechanical, electrical, and instrumentation upgrades to support R&D for the next generation platforms and propulsors. However, in order to appropriately assess designs intended to meet the future hydrodynamic and acoustic goals, additional improvements in tunnel quieting and unsteady flow and acoustic signal processing were required. In addition, improved accuracy and resolution were needed for validation of design tools that will allow 'out of the box' design tradeoffs at the small computational resolutions necessary for acoustics. This report describes the systems acquired under the grant.

DTIC

Acoustic Measurement; Fluid Dynamics; Hydraulic Test Tunnels

20040012572 Radex, Inc., Bedford, MA

Observations and Calibrations of DMSP F15 SSM Data December 1999 - October 2000

Miller, Neil I.; Sexton, L. E.; Jan. 10, 2001; 319 pp.; In English

Contract(s)/Grant(s): F19628-98-C-0054; Proj-7659

Report No.(s): AD-A419157; RXR-030601; AFRL-VS-TR-2003-1576; No Copyright; Avail: CASI; [A14](#), Hardcopy

This report relates the precise calibration study and other observations of data from the Special Sensor Magnetometer

(SSM) mounted on a boom aboard the sun-synchronous, polar-orbiting FI5 satellite of the Defense Meteorological Satellite Program (DMSP) at about 850Km altitude. Data was surveyed for the period from launch in December 1999 until October 2000. The efforts described concentrated upon discerning a more precise in-flight calibration of the SSM instrument, examining the precision of that calibration, noting any unusual phenomena measured by the instrument, and searching for any artifacts caused by the mounting of the sensor upon a 5m boom instead of the upon the body of the spacecraft. Calibration methods, the resulting calibration, and the accuracy of those calibrations are described. Features of the measured ionospheric magnetic field after calibration are illustrated, and attempts are made to attribute those errors to particular sources. The magnetic field impact and mathematical behavior of potential boom-induced artifacts are analyzed and compared to the observed data. The presence, absence, and removal of such features is discussed.

DTIC

Dmsp Satellites; Magnetometers; Calibrating; F-15 Aircraft; Sensors

32

COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 *Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see 03 *Air Transportation and Safety*, and 16 *Space Transportation and Safety*.

20040008866

Overview of IEPME-BW Bandwidth Testing of Bulk Data Transfer

Cottrell, R. L.; Logg, C.; Jul. 2003; 16 pp.; In English

Report No.(s): DE2003-813330; SLAC-PUB-9202; No Copyright; Avail: Department of Energy Information Bridge

Grid Computing capabilities are needed for the High Energy and Nuclear Physics research of today and in the future. Groups such as the Particle Physics Data Grid are developing tools to meet these needs. An additional challenge is the evaluation and fine tuning of these applications, as well as support for long term monitoring, performance analysis, and troubleshooting. In September 2001, SLAC started the development of an infrastructure for measuring the available bandwidth and actual bandwidth utilization that is achievable by the network and various bulk data transfer applications. The purpose of these active and passive measurements is to understand what throughputs are achievable, the constraints, and how to optimize, and to make the data and predictions available for net-workers and application tuning. This paper discusses the measurement methodology and pathologies, analysis, results, and avenues for future development.

NTIS

Bandwidth; Data Transmission

20040008928 Nippon Telegraph and Telephone Public Corp., Japan

Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks

Takahashi, Ryo; Optical Switches for Photonic Networks; October 2003; Volume 1, No. 1, pp. 6-10; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

An optical packet-switched network using asynchronous bursts is often called the ultimate network. To this end, the All-optical Processing Research Group of the Advanced Optoelectronics Laboratory at NTT Photonics Laboratories is researching large-capacity photonic routers. To find out how this research is progressing and what significance it holds in the world at large, we talked with senior research engineer Ryo Takahashi, the unifying force of the All-optical Processing Research Group.

Author

Photonics; Packet Switching; Optical Relay Systems; Communication Networks

20040008929 Nippon Telegraph and Telephone Public Corp., Japan

Recent Progress in Optical Switching Device Technologies in NTT

Maruno, Tohru; Optical Switches for Photonic Networks; October 2003; Volume 1, No. 7, pp. 12-19; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

There have been several important developments in photonic networks based on wavelength division multiplexing in response to the explosive growth of Internet and broadband network services. Since optical processing systems such as optical cross-connects and optical add-drop multiplexers are essential for photonic networks, there is a strong need for optical switching devices, which will be key components of these systems. This paper gives an overview of NTT's recent progress

in low-loss and highly reliable optical switches fabricated by technologies based on planar-lightwave circuits, the oil-latching interfacial-tension variation effect switch, and three-dimensional micro-electro-mechanical systems mirrors.

Author

Microelectromechanical Systems; Optical Switching; Optoelectronic Devices; Light Amplifiers

20040008930 Nippon Telegraph and Telephone Public Corp., Japan

Recent Advances in Optical Switches Using Silica-based PLC Technology

Okuno, Masayuki; Goh, Takashi; Sohma, Shunichi; Shibata, Tomohiro; Optical Switches for Photonic Networks; October 2003; Volume 1, No. 7, pp. 20-31; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

We review recent progress in optical switches based on planar lightwave circuit (PLC) technology. First, we describe the basic configuration and fabrication of silica-based PLC switches. Then, we describe the configuration and characteristics of NxN strictly non-blocking matrix switches (mainly a 16x16 switch), 1xN switches (mainly a 1x128 switch), a 128x128 switching sub-system consisting of 256 1x128 switch modules, and an optical add/drop multiplexing circuit consisting of arrayed waveguide gratings and 2x2 switches. We also report a low power consumption trial for large-scale PLC switches and the results of reliability tests.

Author

Optical Switching; Switching Circuits

20040010443 Helsinki Univ. of Technology, Espoo

Connectivity and Reliability in Ad Hoc Networks

Koskinen, H.; 2003; 66 pp.

Report No.(s): PB2004-101240; Copyright; Avail: National Technical Information Service (NTIS)

An ad hoc network is a research concept that has gained increasing attention lately. It is defined as a wireless multihop network independent of any fixed network infrastructure, formed by mobile terminal devices. There are numerous potential applications for such networks: conferencing, military networks, and networks formed in emergency and rescue operations, just to name a few. Despite a long history of research, the first ad hoc network is yet to be implemented; the nature of ad hoc networks poses several challenging problems. One of them is that of connectivity, namely, the requirement that the network connect every pair of network nodes. This property depends on the pairwise node distances and the range of communication of the nodes. This study addresses the connectivity problem by modeling the network as a geometric random graph.

NTIS

Communication Networks; Wireless Communication

20040010454 Swedish Defence Research Establishment, Stockholm, Sweden

Signal Processing for Acoustic Communications in Underwater Channels using Quadrature Amplitude Modulation

Nilsson, B.; Olofsson, N.; Sangfelt, E.; Oeberg, T.; Nov. 2002; In English

Report No.(s): PB2004-101291; FOI-R-0736-SE; Copyright; Avail: National Technical Information Service (NTIS)

In order to meet the requirements of a net centric warfare concept for the defense, the Swedish navy needs to develop new methods and systems for underwater communication. It is mandatory that important platforms like submarines, ships and unmanned or autonomous underwater vehicles (UUV), acquire links making them accessible to nodes in the network as well as allowing them to co-operate. Several types of links can be exploited, e.g. electromagnetic, acoustic, and laser, among which the acoustic link could be regarded as the generally most usable one for underwater communications. We advocate that we need to explore systems for acoustic underwater communication that have the potential of transferring data at rates of the order k-bits per second over distances of at least tenths of kilometers. To this end, we develop signal processing algorithms designed for acoustic underwater communication using bandwidth efficient modulation schemes such as quadrature amplitude modulation having M symbols or signal waveforms, M-QAM. The channel severely distorts the signals due to multi-path propagation which results in intersymbol interference (ISI) affecting tens or sometimes hundreds of symbols. We describe the design of an adaptive decision-directed feedback equalizer (DFE) which can reduce the ISI and make the message decodable. We also treat the problems of symbol synchronization and compensation for the Doppler Effect. This work is in progress and more results will be presented in a forthcoming report. Here we give preliminary results from an analysis of experimental data. Using 4-QAM transmissions in the Baltic Sea east of Gotland we could decode symbols without errors at data rates up to 8000

bits-S-(sup1) at ranges of 14 km. No channel coding was used which leaves a marginal for improvements.
NTIS

Acoustics; Sound Transmission; Signal Processing; Underwater Communication

20040010457 Swedish Defence Research Establishment, Linköping

Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstrator

Gunnarsson, R.; Erickson, R.; Pettersson, L.; Carlegrim, B.; Leijon, S.; Dec. 2002; In English

Report No.(s): PB2004-101298; FOI-R-0687-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The design and evaluation of properties of a 6-18 GHz dual polarized array antenna is reported. The antenna consists of two co-located linear polarized arrays, with 7x8 tapered slot elements each. The main focus is on experimental evaluation of the radiation characteristics of the antenna. The work has been carried out as part of the Electronic Warfare research program at FOI. The measurements show that a small array can have radiation properties that are in good agreement with ideal, theoretical radiation patterns, in a broad frequency range and for steering angles up to 60 degrees. Interior elements exhibit better agreement than edge elements, as expected. The best agreement is found in the E-plane with more significant discrepancies at low frequencies in the H-plane. This is thought to be due to edge effects, because of the rather small size of the array in terms of wavelength. Experimental and theoretical investigations further predict that the radiated field from an element varies with scan angle, from linear polarization in the principal E- and H-planes to elliptical polarization in the diagonal planes. Theoretical simulations further predict that the plane centre is different in the E- and H-planes of an element. The frequency dependence of the polarization is small in the principal planes and more pronounced in the D-planes.

NTIS

Radiation Distribution; Radiation Dosage; Antenna Arrays; Antenna Radiation Patterns

20040010467

Annual Report 2002 on FOI's Research on Command, Control, Communication and Information Technology (C31)

Gundmark, T.; Jan. 2003; 40 pp.; In Swedish

Report No.(s): PB2004-101545; FOI-R-0779-SE; Copyright; Avail: National Technical Information Service (NTIS)

In this report, FOI research of C31 during 2002 is summarized. The extent and the aim of the research area are shortly described. Also the national and the international evolution of the area are stated. The research activities, which have been performed by projects, are described to contents and results. A great part of the research comprises new and to the Swedish Defense very important areas such as IT Security Information Fusion and Mobile Ad Hoc Networks.

NTIS

Command and Control; Information Systems

20040010469 Swedish Defence Research Establishment, Linköping, Sweden

YMER User Guide

Dahlback, M.; Nov. 2002; 50 pp.; In Swedish

Report No.(s): PB2004-101548; FOI-R-0702-SE; Copyright; Avail: National Technical Information Service (NTIS)

Within the project 'Communication Jamming' the ideas of Tarax have been developed. The Tarax system are mostly dealing with jamming but there are much more capabilities. This user guide tells how to use another capability in which the system will catch and follow radio signals within the system's active area.

NTIS

Communication Equipment; Jamming; Radio Signals

20040010470 Newcastle-upon-Tyne Univ., Newcastle

High Coverage Multicasting for Mobile Ad-hoc Networks

Cooper, D. E.; Ezhilchelvan, P.; Mitrani, I.; 2003; 16 pp.

Report No.(s): PB2004-101929; No Copyright; Avail: CASI; A03, Hardcopy

A family of message propagation protocols for highly mobile ad-hoc networks is defined, and is studied analytically and by simulation. The coverage of a message (the fraction of nodes that receive it), can be made arbitrarily close to 1, at a moderate cost of extra message traffic. Under certain simplifying assumptions, it is shown that a high coverage is achieved by making a total of $O(n \ln n)$ broadcasts, where n is the number of nodes, and the time to propagate a message is $O(\ln n)$.

The effect of various parameters on the protocol performance is examined.

NTIS

Mobile Communication Systems; Multichannel Communication

20040010876 Texas Univ., San Antonio, TX, USA

Telecommunication Networks for Mobile & Distributed Communications/ Computing

Roy, Sumit; Dec. 2001; 30 pp.; In English

Contract(s)/Grant(s): F49620-96-1-0472

Report No.(s): AD-A418978; AFRL-SR-AR-TR-03-0499; No Copyright; Avail: CASI; [A03](#), Hardcopy

This is the final report for the grant F49620-96-1- 0472 which ended on Dec. 31, 2000. During the period from September 1996 through December 2000, the main objectives were to: 1. Build a research infrastructure (equipment, faculty, students) 2. Develop faculty research opportunities 3. Develop a graduate student research program within the Computer Science and Electrical Engineering Departments.

DTIC

Communication Networks; Mobile Communication Systems; Research and Development

20040012586 Connecticut Univ., Storrs, CT

Large-Scale Multi-Agent Distributed Mission Planning and Execution in Complex Dynamic Environments

Santos, Eugene, Jr.; Jan. 1999; 6 pp.; In English

Contract(s)/Grant(s): F49620-99-1-0244

Report No.(s): AD-A418998; AFRL-SR-AR-TR-03-0485; No Copyright; Avail: CASI; [A02](#), Hardcopy

Multi-Agent Distributed Goal Satisfaction, MADGS, is a JAVA-based mobile-agent system under development to facilitate distributed mission planning and execution in complex dynamic environments with a focus on distributed goal satisfaction. The MADGS system represents the union of five separate components, Agent-Server (named Carolina), mobile-agents, Distributed Goal Satisfaction (DGS), agentTool, and Prodigy. The target real-world operational environment for the MADGS system is a network topology consisting of intermittent nodes and uncertain network connections that exist in a large-scale, multi-platform dynamic network. The resulting design developed for this environment addresses the communications issues faced when handling massive numbers of mobileagents in such a topology. Our primary contribution to date has been examining the communications infrastructure requirements and changing how real-time mission planning and execution can be achieved without re-planning in the face of plan failures.

DTIC

Mission Planning; Topology

20040012672 NASA Marshall Space Flight Center, Huntsville, AL, USA

Objective Classification of Radar Profile Types, and Their Relationship to Lightning Occurrence

Boccippio, Dennis; [2003]; 1 pp.; In English; Fall American Geophysical Union Conference, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

A cluster analysis technique is used to identify 16 'archetypal' vertical radar profile types from a large, globally representative sample of profiles from the TRMM Precipitation Radar. These include nine convective types (7 of these deep convective) and seven stratiform types (5 of these clearly glaciated). Radar profile classification provides an alternative to conventional deep convective storm metrics, such as 30 dBZ echo height, maximum reflectivity or VIL. As expected, the global frequency of occurrence of deep convective profile types matches satellite-observed total lightning production, including to very small scale local features. Each location's 'mix' of profile types provides an objective description of the local convective spectrum, and in turn, is a first step in objectively classifying convective regimes. These classifiers are tested as inputs to a neural network which attempts to predict lightning occurrence based on radar-only storm observations, and performance is compared with networks using traditional radar metrics as inputs.

Author

Cluster Analysis; Classifications; Lightning; Position (Location)

ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20040008557 Swedish Defence Research Establishment, Linköping

Protections Against HPM Front-Door Coupling: A Survey of Commercial Limiters

Nilsson, T.; Apr. 2003; 48 pp.; In English

Report No.(s): PB2004-101740; FOI-R-0863-SE; Copyright; Avail: National Technical Information Service (NTIS)

This report provides a survey of commercial limiters. There is a number of different technologies that potentially can be used for circuit protection against HPM front-door coupling and other electromagnetic interferences. One of the aims with this report is to serve as the basis for deciding on which protection devices shall be purchased and tested regarding their potentials for protection against HPM. The other aim is to create a general survey of different technologies/types of limiters that can be used for HPM protection. Essential properties of the different limiter technologies have been investigated in order to sort out which ones can be of interest. The conclusion is that only a few limiters meet the demands for protection against HPM front-door coupling. These limiters are probably best used in a combination to achieve a good overall protection. Front-door protections can be used in the future network centric defense, where the systems for communications and sensors, has to be protected from harmful pulses.

NTIS

Electromagnetic Interference; Circuit Protection; Limiter Circuits; Doors

20040008602 NASA Glenn Research Center, Cleveland, OH, USA

Baseline Testing of the Club Car Carryall With Asymmetric Ultracapacitors

Eichenberg, Dennis J.; November 2003; 27 pp.; In English

Contract(s)/Grant(s): WBS 22-251-30-12

Report No.(s): NASA/TM-2003-212705; E-14215; No Copyright; Avail: CASI; [A03](#), Hardcopy

The NASA John H. Glenn Research Center initiated baseline testing of the Club Car Carryall with asymmetric ultracapacitors as a way to reduce pollution in industrial settings, reduce fossil fuel consumption, and reduce operating costs for transportation systems. The Club Car Carryall provides an inexpensive approach to advance the state of the art in electric vehicle technology in a practical application. The project transfers space technology to terrestrial use via non-traditional partners, and provides power system data valuable for future space applications. The work was done under the Hybrid Power Management (HPM) Program, which includes the Hybrid Electric Transit Bus (HETB). The Carryall is a state of the art, ground up, electric utility vehicle. A unique aspect of the project was the use of a state of the art, long life ultracapacitor energy storage system. Innovative features, such as regenerative braking through ultracapacitor energy storage, are planned. Regenerative braking recovers much of the kinetic energy of the vehicle during deceleration. The Carryall was tested with the standard lead acid battery energy storage system, as well as with an asymmetric ultracapacitor energy storage system. The report concludes that the Carryall provides excellent performance, and that the implementation of asymmetric ultracapacitors in the power system can provide significant performance improvements.

Author

Electrochemical Capacitors; Aerospace Engineering; Asymmetry; Electric Automobiles

20040008922 Nippon Telegraph and Telephone Public Corp., Japan

NTT Technical Review, Volume 1, No. 7

Wada, Masato, Editor; Fukuda, Kenichi, Editor; Shibata, Tsugumichi, Editor; Sawaki, Minako, Editor; Sadakata, Toru, Editor; Ida, Minoru, Editor; Iwata, Hideyuki, Editor; Minato, Shin-Ichi, Editor; Sakai, Yoshihisa, Editor; Kobayashi, Junya, Editor, et al.; October 2003; ISSN 1348-3447; 102 pp.; In English; See also 20040008923 - 20040008939; Copyright; Avail: Other Sources

NTT Science and Core Technology Laboratory Group is undertaking the cutting-edge R&D needed to support future ubiquitous and broadband services. R&D activities are being conducted at Atsugi, Musashino, Yokosuka, and Keihanna. While the other two laboratory groups (NTT Cyber Communications Laboratory Group and NTT Information Sharing Laboratory Group) aim to boost NTT business in the near future, we are targeting the more distant future. Papers included in this review: Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks; Recent Progress in Optical Switching Device Technologies in NTT; Recent Advances in Optical Switches Using Silica-based PLC Technology;

High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks; Development of a Large-scale 3D MEMS Optical Switch Module; Monolithically Integrated 64-channel WDM Channel Selector; A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator; Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting; Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications; Scalable Content Delivery Technology; Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions; Image Systems Using RFID Tag Positioning Information; Spot Information Navigator; Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T; Three Leading Japanese Firms Jointly Develop a New Encryption Technology Elliptic Curve Cryptosystem (ECDSA Signature); Most Advanced Wireless Technology in Scotland Launched at EICC; and A Step Closer to Diamond Devices for Communication Satellites, Broadcasting Stations, and Radars.

Derived from text

Semiconductor Devices; Computer Networks; Computer Information Security; Broadcasting

20040008927 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan

Diamond Semiconductors Operate at Highest Frequency Ever: A Step Closer to Diamond Devices for Communication Satellites, Broadcasting Stations, and Radars

NTT Technical Review, Volume 1, No. 7; October 2003, pp. 97-99; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

NTT has developed diamond semiconductor devices whose operating frequency and power are the highest in the world. These diamond devices will one day replace the vacuum tubes now used in the very- high-frequency, very-high-power region, leading to increased output power in communication satellites, television broadcasting stations, and radars. NTT Basic Research Laboratories, in collaboration with the University of Ulm, Germany, succeeded in fabricating a diamond semiconductor device using high-purity diamond crystals. The device's highest operating frequency is 81 GHz. It therefore operates as an amplifier in the millimeter region (correspond- ing to a frequency of 30 to 300 GHz), which is the first time this has been achieved for any kind of dia- mond device. Owing to the properties of diamond, the device dissipates heat very rapidly and can with- stand operation at very high voltages, and will operate very stably even in space.

Derived from text

Semiconductor Devices; Diamonds; Fabrication

20040008933 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan

Monolithically Integrated 64-channel WDM Channel Selector

Kikuchi, Nobuhiro; Shibata, Yasuo; Tohmori, Yuichi; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 43-49; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

Wavelength division multiplexing (WDM) channel selectors will be key devices in future photonic net- works. In this paper, we describe a novel WDM channel selector configuration that lets the selector handle a large number of WDM channels. The selector consists of two arrayed waveguide gratings, two stages of semiconductor optical amplifier gates, and a coupler. Based on this configuration, we developed the first monolithically integrated 64-channel WDM channel selector on an InP substrate. Loss-less operation was achieved for all channels. The typical sensitivity penalty for a 10-Gbit/s NRZ (non-return to zero) signal was measured to be 1.3 dB. Fast switching of less than 1.5 ns was obtained.

Author

Wavelength Division Multiplexing; Semiconductors (Materials); Sensitivity; Switching

20040008934 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Image Systems Using RFID Tag Positioning Information

Nakagawa, Shin-Ichi; Soh, Ken-Ichiro; Mine, Shin-Ichi; Saito, Hiroshi; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 79-83; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

We have developed a system that automatically selects images from particular cameras based on RFID (radio frequency identification) tags that identify individual persons or objects, thus enabling each user to receive desired images via Ip networks. For example, if an RFID tag is inserted in the nametag of a kindergarten child and several cameras are installed in the kindergarten, the system automatically switches the transmitted images according to the child's movements so that the parents can watch their own child from home or the office.

Author

Images; Radio Frequencies; Computer Networks; Tracking (Position)

20040008935 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan

A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator

Matsuo, Shinji; Ohiso, Yoshitaka; Segawa, Toru; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 50-57; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

A high-speed tunable optical filter incorporating a semiconductor ring resonator is a key device in photonic packet switching. To achieve a wide tuning range we designed a double-ring structure, in which two ring resonators are connected in series, and fabricated it using the InGaAsP-InP material system. This device exhibits a total free spectral range (FSR) of 1.7 THz and contrast ratio of 9.5 dB. The ring radii are 25.2 and 17.8 μm , which correspond to FSRs of 340 and 425 GHz, respectively. The switching time of the device is 2.5 ns.

Author

Optical Filters; Tunable Filters; Packet Switching

20040008937 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan

Spot Information Navigator

Tanabe, Hiromitsu; Kihara, Tamio; Honishi, Takashi; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 84-88; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

To provide advertising information effectively, one must consider when it is provided, as well as where and how many times the customer encounters it. In the future ubiquitous society, the systems using various kinds of sensors connected to the network will be needed. Spot Information Navigator gathers data about shopping conditions in radio frequency tags, camera images, and other types of sensors, and provides appropriate advertising information to customers accordingly.

Author

Radio Frequencies; Tracking (Position); Computer Networks

20040008938 Nippon Telegraph and Telephone Public Corp., Chiba, Japan

Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T

Tatsuta, Tsutomu; Yoshida, Yukihiko; Maeda, Yoichi; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 89-93; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

Over the last few years, access line speeds have continued to advance due to the growth of the ADSL (asymmetric digital subscriber line) service. However, since ADSL suffers from limited transmission speed and distance because it uses conventional metallic cables, optical access is expected to become the default broadband access system in the future. For this reason, ITU-T (International Telecommunication Union-Telecommunication Standardization Sector) has been discussing a standard for optical access systems called G-PON (Gigabit passive optical network), which is an optical access system with gigabit-per-second-class transmission capability; it is suitable as the next-generation optical access system.

Author

Computer Networks; Optical Fibers

20040010345 Department of the Navy, Washington, DC

Apparatus and Method for Calibrating Voltage Spike Waveforms

Muhitch, Joseph M., Inventor; Aug. 26, 2003; 26 pp.; In English

Patent Info.: Filed 26 Aug. 2003; US-Patent-Appl-SN-10652079

Report No.(s): AD-D020104; No Copyright; Avail: Other Sources

It is therefore an object of the present invention to provide an apparatus and method for calibrating voltage spike waveforms that are used to test the survivability and compatibility characteristics of electrical equipment including military and commercial off-the-shelf electrical devices. It is another object of the present invention that the aforesaid apparatus and method be relatively inexpensive to implement. Thus, the present invention is directed to, in one aspect, an apparatus for calibrating voltage spikes used in testing an electrical device, comprising an input for receiving a voltage spike, and power supply inputs for receiving power for energizing an electrical device under test. The power supply inputs comprise a high voltage input, a common input and a ground input. The apparatus further comprises a plurality of outputs comprising a high voltage output, a common output, and a ground output. The plurality of outputs are configured for connection to corresponding high voltage, common and ground inputs of the electrical device under test. The power supply common and ground inputs are connected to the common and ground outputs, respectively. The apparatus further comprises a circuit for connecting and disconnecting the power supply high voltage input to and from, respectively, the high voltage output, selecting a pair of the

plurality of outputs, transforming the voltage spike into a predetermined voltage spike waveform, and applying the predetermined voltage spike waveform to the selected pair of outputs.

DTIC

Patent Applications; Waveforms; Electric Equipment

20040010390 Sarnoff Corp., Princeton, NJ

Bistable Reflective Etalon (BRET)

Shellenbarger, Zane; Abeles, Joseph H.; Sep. 2003; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-02-C-0162; Proj-2002

Report No.(s): AD-A418753; AFRL-SN-RS-TR-2003-210; No Copyright; Avail: CASI; [A03](#), Hardcopy

This project designed, fabricated, and characterized normal-incidence etalon structures at 1550 nm wavelength operation for application, as bistable elements, to photonic analog-to-digital conversion. The semiconductor devices consist of planar multi-quantum well saturable absorbers situated within an etalon defined by epitaxially grown reflective distributed Bragg reflector mirrors. Two iterations were completed and characterized in a transmissive configuration of greatest interest to Air Force Research Laboratories. Nonlinear transmission was observed. Bistability could not be obtained. Detailed modeling showed that thermal mechanisms override the quantum well nonlinearity, even at sub-nsec time scales, owing to the very small size of the etalon (several microns). However, waveguide configurations, with longer optical paths (hundreds of microns or larger), are well-suited for bistability, as demonstrated both through modeling and experimental results. Results of this effort suggest that the main obstacle to bistability in the BRET structure was heating effects. It is concluded that a future approach is to use bistable ridge waveguides instead of bistable vertical cavities. Bistability has been observed in such devices fabricated for other purposes.

DTIC

Analog to Digital Converters; Iteration

20040010444 Helsinki Univ. of Technology, Espoo, Finland

Helsinki University of High Voltage Institute Annual Report 2002

Aro, M.; Jan. 2003; 30 pp.

Report No.(s): PB2004-101241; TKK-SJT-57; Copyright; Avail: National Technical Information Service (NTIS)

Activities of the high Voltage Institute in year 2002, the eighth full year of the Institute, are described and summarized. Research is largely concentrated on high-voltage measuring techniques and metrology, and on diagnostics of high-voltage insulation systems.

NTIS

High Voltages; Metrology

20040010455 Swedish Defence Research Establishment, Tumba

Electrical Equivalent Circuit Simulations of the Pulsed-Power Conditioning System TTHPM

Larsson, A.; Nyholm, S. E.; Dec. 2002; In English

Report No.(s): PB2004-101292; FOI-R-0673-SE; No Copyright; Avail: National Technical Information Service (NTIS)

During the last four years, research has been performed at FOI Grindsjon Research Center regarding the performance of a pulsed-power conditioning system named 'Table-Top High Power Microwave (TTHPM) demonstrator'. One powerful way of analyzing pulsed-power systems is to perform electric circuit simulations. To perform such simulations, the different parts of the system must be represented by electric equivalent circuits. This report outlines how the TTHPM pulsed-power conditioning system can be represented by such circuits, and estimates of the parameters of these equivalent circuits are also given. Finally, the electric equivalent circuit scheme is implemented into two different circuit simulation tools, namely PSpice and ATP-EMTP.

NTIS

Circuits; Computerized Simulation; Simulation

20040010462 Swedish Defence Research Establishment, Stockholm, Sweden

A Base for the Construction of a Calibration Current Source

Lindqvist, P.; May 2003; 20 pp.; In Swedish

Report No.(s): PB2004-101525; FOI-R-0868-SE; Copyright; Avail: National Technical Information Service (NTIS)

The report is a base for the construction of a calibration current source. The construction base specifies the functionality

and performance of the electronic parts. Examples on how some of the demands have been achieved at FOI are given at the end. The construction base does not consider security aspects, mechanical housing, construction drawings of the electronics, choice of components or other mechanical demands.

NTIS

Calibrating; Construction; Electronic Equipment

20040010468 Swedish Defence Research Establishment, Tumba

Fast Charging of Capacitors: A Summary of a Master Thesis at Uppsala University

Larsson, A.; Sep. 2002; 22 pp.; In Swedish

Report No.(s): PB2004-101546; FOI-R-0590-SE; Copyright; Avail: National Technical Information Service (NTIS)

At fast charging and discharging of capacitors, it is possible to overcharge these to significantly higher energy density than the nominal value. This report summarizes a Master Thesis conducted at the division for electricity and lightning research, Uppsala University, where commercially available capacitors have been fast charged and discharged and their ability to be overcharged has been studied.

NTIS

Capacitors; Charging

20040010519 Budapest Univ. of Technology and Economics, Budapest, Hungary

Periodica Polytechnica Electrical Engineering, Volume 46, No. 1-2, 2002

2003; 130 pp.

Report No.(s): PB2004-100972; REPT-2002-46/1-2; No Copyright; Avail: CASI; [A07](#), Hardcopy

Contents include the following: Investigation of Induction Heating of Non-Ferromagnetic Metal Staff-Space with Corrugated Surface: The Exciting Magnetic Field is Parallel to the Enveloping Line of the Corrugated Profile; Investigation of Induction Heating of Non-Ferromagnetic Metal Half-Space with Corrugated Surface: The Exciting Magnetic Field is Perpendicular to the Plane of the Corrugated Profile; Mapping, Detection and Handling of Singularities for Kinetically Redundant Serial Manipulators; Implementing Elliptic Curve Cryptography on PC and Smart Card; Methods of Checking and Using Safety Criteria; and On the Impact of Link/Node Failures and Network Applications on the Load and Call Processing Times in ATM Networks.

NTIS

Electrical Engineering; Ferromagnetic Materials; Induction Heating

20040010674 Alien Technology Corp., Morgan Hill, CA, USA

Polymer Light-Emitting Diode (PLED) Process Development

Bernkopf, Jan; Hermanns, Anno; Kusel, Julian; Shi, Yijian; Herrmann, Scott; Tolt, Zhidan; Drzaic, Paul; Dec. 2003; 186 pp.; In English

Contract(s)/Grant(s): DAAD16-00-C-9234

Report No.(s): AD-A419070; NATICK-TR-04/005; No Copyright; Avail: CASI; [A09](#), Hardcopy

This report documents the effort and results of process development leading to a direct driven polymer light-emitting diode (PLED) display on a flexible substrate manufactured on roll-to-roll line. The challenge was twofold: i) to design and fabricate PLED specific NanoBlock integrated circuit (IC) for current driven display devices, and ii) to integrate very sensitive PLED processes (in terms of morphology and topography) with a back plane having embedded NanoBlock ICs under the PLED active area. Each NanoBlock IC provides eight independent constant current supplies for eight display pixels with capability of 4 bit gray scale. The development of integrated NanoBlock IC back plane is described in detail including the description of final optimized structure. The successful integration is documented on a segmented display driven by six NanoBlock ICs embedded in the display back plane. The results are compared with the goals of the Task 1.1.5. Also the effort to identify a web compatible coating technology for PLED materials is also provided. The report is closed with a summary of conclusions and recommendations for Phase II of the Flexible Display Program.

DTIC

Light Emitting Diodes; Polymers; Display Devices; Manufacturing

20040010693 Oak Ridge National Lab., TN

Dual Mode Inverter Control Test Verification

Bailey, J. M.; McKeever, J. W.; Scudiere, M. B.; Su, G. J.; Ayers, C. W.; Mar. 2001; 42 pp.; In English

Report No.(s): DE2003-814403; ORNL/TM-2000/172; No Copyright; Avail: Department of Energy Information Bridge

Permanent Magnet Motors with either sinusoidal back emf (permanent magnet synchronous motor(PMSM)) or trapezoidal back emf (brushless dc motor(BDCM)) do not have the ability to alter the air gap flux density (field weakening). Since the back emf increases with speed, the system must be designed to operate with the voltage obtained at its highest speed. Oak Ridge National Laboratory's (ORNL) Power Electronics and Electric Machinery Research Center (PEEMRC) has developed a dual mode inverter controller (DMIC) that overcomes this disadvantage. This report summarizes the results of tests to verify its operation. The standard PEEMRC 75 kW hard-switched inverter was modified to implement the field weakening procedure (silicon controlled rectifier enabled phase advance). A 49.5 hp motor rated at 2800 rpm was derated to a base of 400 rpm and 7.5 hp. The load developed by a Kahn Industries hydraulic dynamometer, was measured with a MCRT9-02TS Himmelstein and Company torque meter. At the base conditions a current of 212 amperes produced the 7.5 hp. Tests were run at 400, 1215, and 2424 rpm. In each run, the current was no greater than 214 amperes. The horsepower obtained in the three runs were 7.5, 9.3, and 8.12. These results verified the basic operation of the DMIC in producing a Constant Power Speed Ratios (CPSR) of six.

NTIS

Torquemeters; Controllers; Inverters

20040010814 Massachusetts Inst. of Tech., Lexington, MA

Solid State Research Quarterly Technical Report 2003:3

Shaver, David C.; Dec. 18, 2003; 89 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F19628-00-C-0002

Report No.(s): AD-A418916; ESC-TR-2003-077; No Copyright; Avail: CASI; [A05](#), Hardcopy

This report covers in detail the research work of the Solid State Division at Lincoln Laboratory for the period 1 May through 31 July 2003. Chapter 1, on quantum electronics, contains the paper 'Widely Tunable, Aluminum-Free GaSb-Based, Mid-Infrared Semiconductor Lasers.' Chapter 2, on electrooptical materials and devices, contains the paper 'Model of Tunneling Resistivity between Bonded Semiconductor Wafers.' Chapter 3, on submicrometer technology, contains two papers: 'Method for Testing Electronic Self-Assembled Monolayers Using a Flip-Chip Arrangement' and 'Simulation Study of Process Latitude for Liquid Immersion Lithography.' Chapter 4, on biosensor and molecular technologies, contains the paper 'Toxin Detection with CANARY.' Chapter 5, on advanced imaging technology, contains the paper 'Chemisorption- Charging Process for Back-Illuminated Image Sensors.' Chapter 6, on analog device technology, contains the paper 'Design of a Coupled Two-Qubit Quantum Computer Element.' And Chapter 7, on advanced silicon technology, contains the paper 'Substrate Removal and BOX Thinning Effects on Total Dose Response of FDSOI nMOSFET.' Funding is provided by several DoD organizations, including the Air Force, Army, DARPA, MDA, Navy, NSA, and OSD, and also by the DOE, NASA, and NIST. (46 figures, chapter refs.)

DTIC

Solid State; Tunable Lasers; Quantum Electronics

20040010826 OmniGuide Communications, Inc., Cambridge, MA, USA

Design and Simulation of Transmission Properties of Hollow Bragg Fibers Fabricated from Omnidirectionally Reflective Composite Dielectric Materials

Skorobogatiy, M.; Jacobs, Steven A.; Fink, Yoel; Jan. 2002; 37 pp.; In English

Contract(s)/Grant(s): F49620-02-C-0089

Report No.(s): AD-A418903; AFRL-SR-AR-TR-03-0513; No Copyright; Avail: CASI; [A03](#), Hardcopy

In Phase I we developed an extensive set of tools to simulate the performance of Omni-Guide fibers; hollow. high POWER transmission fibers employing an omni-directional dielectric minor as the confining mechanism. Separately. we have experimentally confirmed the validity of many of the tools. Our theoretical/numerical analysis of field propagation through Omni-Guide fibers addressed several major design aspects. Objectives for the tools we developed were as follows: 1) Optimal design of Omni Guide fibers. including reduction of absorption and radiation losses. 2) Assessment of coupling efficiency between the high power lasers and the guided modes of an Omni-Guide fiber. 3) Determination of beam quality degradation (M2) due to the inter-modal scattering caused by bends and other fiber imperfections. including diameter and ellipticity variations along the fiber. 4) Determination of the thermal stability of the fibers including equilibrium and non-equilibrium temperature distributions across the fiber due to CW and pulsed sources. Study of the effects of bends and other geometrical variations on fiber heating. 5) Analysis of devices based on Omni-Guide fibers using the Beam Propagation Method.

DTIC

Lasers; Fiber Optics; Reflectance; Design Analysis

20040010831 Washington Univ., Seattle, WA

Instrumentation Facility for the Evaluation of Photonic and Opto-Electronic Materials

Jen, Alex K-Y.; Nov. 20, 2002; 12 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0259

Report No.(s): AD-A418929; AFRL-SR-AR-TR-03-0501; No Copyright; Avail: CASI; [A03](#), Hardcopy

The objective of this DURIP program is to develop an integrated instrumentation package that combines the capability of performing accurate and complete materials evaluation and shortening the time required to make critical characterization information available to device engineers and DoD program managers. The facility established in this program is capable of efficiently and systematically characterizing electrical and optical properties of organic conjugated oligomers and polymers for LEDs, solid state lasers, two-photon absorption, and photovoltaic cell applications.

DTIC

Photons; Evaluation; Electro-Optics; Absorbers (Materials)

20040012588 Duke Univ., Durham, NC

Fabrication and Modification of Metal and Semiconductor Nanostructures Using Atomic Force Microscope

Liu, Jie; Jan. 2002; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-02-1-0206

Report No.(s): AD-A419000; AFRL-SR-AR-TR-03-0484; No Copyright; Avail: CASI; [A02](#), Hardcopy

Fund from the DURIP award was used to purchase an Atomic Force Microscope (Autoprobe CP from Veeco, CA). The unique closed-loop controller enables the instrument to have precise control of the locations of the AFM tips over a substrate. Such a capability has enabled the local chemical modification of nanostructures directly under the AFM tips. Over the project period, the instrument was purchased and installed and local chemical modification of GaN nanowires have been demonstrated. The transport properties of the nanoscale electronic device made of GaN nanowires between two metal electrodes showed significant change upon the AFM based chemical modification. The effect of applied voltage, reaction time and relative humidity was also studied.

DTIC

Semiconductors (Materials); Nanostructures (Devices)

20040012593 Allwood and Associates, Inc., Mentor, OH, USA

Tri-Services Workshop on Process Induced Defects in Wide Bandgap Semiconductors

Allwood, Shari J.; Aug. 2003; 87 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0293

Report No.(s): AD-A418999; TS0303; AFRL-SR-AR-TR-03-0505; No Copyright; Avail: CASI; [A05](#), Hardcopy

Meeting program, abstracts, and attendee roster for Tri-Services Workshop on Process Induced Defects in Wide Bandgap Semiconductors held in Grants Pass, OR, on August 17- 21, 2003. Sponsored by the Air Force Office of Scientific Research; U.S. Army Research Office; and Office of Naval Research.

DTIC

Energy Gaps (Solid State); Semiconductors (Materials)

20040012660 NASA Ames Research Center, Moffett Field, CA, USA

The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays

Li, Jun; Cassell, Alan; Koehne, Jessica; Chen, Hua; Ng, Hou Tee; Ye, Qi; Stevens, Ramsey; Han, Jie; Meyyappan, M.; [2003]; 1 pp.; In English; AVS 50th International Symposium, 2-7 Nov. 2003, Baltimore, MD, USA; No Copyright; Avail: Other Sources; Abstract Only

We report on our recent breakthroughs in two different applications using well-aligned carbon nanotube (CNT) arrays on Si chips, including (1) a novel processing solution for highly robust electrical interconnects in integrated circuit manufacturing, and (2) the development of ultrasensitive electrochemical DNA sensors. Both of them rely on the invention of a bottom-up fabrication scheme which includes six steps, including: (a) lithographic patterning, (b) depositing bottom conducting contacts, (c) depositing metal catalysts, (d) CNT growth by plasma enhanced chemical vapor deposition (PECVD), (e) dielectric gap-filling, and (f) chemical mechanical polishing (CMP). Such processes produce a stable planarized surface with only the open end of CNTs exposed, which can be further processed or modified for different applications. By depositing patterned top contacts, the CNT can serve as vertical interconnects between the two conducting layers. This method is

fundamentally different from current damascene processes and avoids problems associated with etching and filling of high aspect ratio holes at nanoscales. In addition, multiwalled CNTs (MWCNTs) are highly robust and can carry a current density of $10(\exp 9)$ A/square centimeters without degradation. It has great potential to help extending the current Si technology. The embedded MWCNT array without the top contact layer can be also used as a nanoelectrode array in electrochemical biosensors. The cell time-constant and sensitivity can be dramatically improved. By functionalizing the tube ends with specific oligonucleotide probes, specific DNA targets can be detected with electrochemical methods down to subattomoles.

Author

Bioinstrumentation; Carbon Nanotubes; Arrays; Joining; Electric Connectors; Sensitivity

20040012778 Massachusetts Inst. of Tech., Cambridge, MA

Sub-1nm Patterning Accuracy via Spatial-Phase Locking

Smith, Henry I.; Dec. 19, 2003; 35 pp.; In English

Contract(s)/Grant(s): DAAD19-99-1-0280

Report No.(s): AD-A419136; ARO-40302.3-EL; No Copyright; Avail: CASI; [A03](#), Hardcopy

Scanning-electron-beam lithography (SEBL) is an essential tool for creating patterns of arbitrary geometry at feature sizes below 100 nm, even down to 15 nm dimensions. Aside from the slow writing speed, the most outstanding problem of SEBL is its inability to achieve pattern-placement accuracy that is compatible with its resolution. For example, commercial SEBL systems, costing several millions of dollars, can under the most ideal conditions achieve placement accuracy of about 20 nm. To solve this problem MIT invented and has pursued a novel approach called spatial-phase locking. The objective of this grant was to demonstrate the efficacy of spatial-phase-locked e-beam lithography (SPLEBL) in achieving 1-nm level placement accuracy. SPLEBL replaces the normally open-loop approach to scanning-electron-beam lithography (SEBL) with a closed-loop approach.

DTIC

Phase Locked Systems; Scanning; Lithography

20040012836 Massachusetts Inst. of Tech., Lexington, MA

Green Bank Telescope 290 to 395 MHz Feed Analysis and Modification for Operation in the 140 to 175 MHz Band

Fenn, Alan J.; Srikanth, Sivasankaran; Dec. 17, 2003; 46 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F19628-00-C-0002

Report No.(s): AD-A419343; TR-1089; ESC*-TR-2003-058; No Copyright; Avail: CASI; [A03](#), Hardcopy

A previously developed 290 to 395 MHz short backfire antenna feed for the Green Bank Telescope (GBT) has been modified for operation in the 140 to 175 MHz VHF band. The feed has been modeled with the Electromagnetic Surface Patch code, Version 5 (ESP5) software, developed at Ohio State University (OSU) to predict the feed radiation patterns and with OSU SatCom Workbench software to predict the GBT radiation patterns. Measured feed radiation patterns are in good agreement with the electromagnetic model. This lower-frequency VHF feed is suitable for use as a receive antenna for the GBT.

DTIC

Backfire Antennas; Telescopes; Antenna Arrays; Antenna Feeds; Frequencies

20040012870 Stanford Linear Accelerator Center, Stanford, CA, USA

Combining Electric and Sail Propulsion for Interplanetary Sample Return

Noble, R. J.; 2003; 16 pp.; In English

Report No.(s): DE2003-812627; SLAC-PUB-9624; No Copyright; Avail: Department of Energy Information Bridge

Fast sample return from the outer Solar System would open an entirely new avenue for space science, but the vast distances make this a daunting task. The achievable transit velocity and the need for extra propellant on the return trip limit the feasibility of returning extraterrestrial samples to Earth. To keep the mission duration short enough to be of interest, sample return from objects farther out in the Solar System requires increasingly higher velocities. High specific impulse, electric propulsion reduces the propellant required for the outbound and return trips, but decelerating the spacecraft at the inner Solar System from high velocity still involves a long, inward spiral trajectory. The use of solar sails to rapidly decelerate incoming sample capsules and eliminate propellant is explored in this paper. The sail is essentially a solar parachute used for braking at the end of the interplanetary return flight, permitting a higher transit speed and truncating the deceleration spiral. In this

application the sail is relatively small and manageable since only the sample capsule and its sail are decelerated.
NTIS

Solar System; Propulsion System Configurations; Sample Return Missions; Interplanetary Flight; Electric Propulsion

20040012889 National Defence Research Establishment, Linköping, Sweden

Time Synchronization of a TDA-Based Position Finding System

Johansson, D.; Dec. 2002; In Swedish; In English

Report No.(s): PB2004-101729; FOI-R-0649-SE; No Copyright; Avail: National Technical Information Service (NTIS)

In this report the possibilities and problems on synchronous data acquisition for geographically separated TDOA-receivers are considered. In this case, the receiver's synchronization is specified to max 10 ns deviation for 24 hours. An inventory of reliable methods and existing products has been made. Performance, price, complexity and availability are factors that were taken into consideration in the evaluation.

NTIS

Data Acquisition; Receivers; Geographic Information Systems

20040012895 Oak Ridge National Lab., TN

Quarterly Technical Progress Report of Radioisotope Power System Materials Production and Technology Program Tasks for January through March 2000

2003; 44 pp.; In English

Report No.(s): DE2003-814240; No Copyright; Avail: Department of Energy Information Bridge

The Office of Space and Defense Power Systems (OSDPS) of the Department of Energy (DOE) provides Radioisotope Power Systems (RPS) for applications where conventional power systems are not feasible. For example, radioisotope thermoelectric generators were supplied by the DOE to the National Aeronautics and Space Administration for deep space missions including the Cassini Mission launched in October of 1997 to study the planet Saturn. The Oak Ridge National Laboratory (ORNL) has been involved in developing materials and technology and producing components for the DOE for more than three decades. For the Cassini Mission, for example, ORNL was involved in the production of carbon-bonded carbon fiber (CBCF) insulator sets, iridium alloy blanks and foil, and clad vent sets (CVSs) and weld shields (WSs).

NTIS

Cassini Mission; NASA Programs; Radioisotope Batteries; Thermoelectric Generators

20040012934 NASA Goddard Space Flight Center, Greenbelt, MD, USA, Maryland Univ., College Park, MD, USA

Field-effect Flow Control in Polymer Microchannel Networks

Sniadecki, Nathan; Lee, Cheng S.; Beamesderfer, Mike; DeVoe, Don L.; [2003]; 4 pp.; In English; IEEE Transducers '03, 8-13 Jun. 2003, Boston, MA, USA; Copyright; Avail: CASI; [A01](#), Hardcopy

A new Bio-MEMS electroosmotic flow (EOF) modulator for plastic microchannel networks has been developed. The EOF modulator uses field-effect flow control (FEFC) to adjust the zeta potential at the Parylene C microchannel wall. By setting a differential EOF pumping rate in two of the three microchannels at a T-intersection with EOF modulators, the induced pressure at the intersection generated pumping in the third, field-free microchannel. The EOF modulators are able to change the magnitude and direction of the pressure pumping by inducing either a negative or positive pressure at the intersection. The flow velocity is tracked by neutralized fluorescent microbeads in the microchannels. The proof-of-concept of the EOF modulator described here may be applied to complex plastic microchannel networks where individual microchannel flow rates are addressable by localized induced-pressure pumping.

Author

Microchannels; Modulators; Microfluidic Devices; Microelectromechanical Systems; Fabrication; Electric Fields; Flow Regulators; Polymers

20040012946 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Amateur Radio on the International Space Station - Phase 2 Hardware System

Bauer, F.; McFadin, L.; Bruninga, B.; Watarikawa, H.; September 2003; 9 pp.; In English; AMSAT Symposium, 16-19 Oct. 2003, Toronto, Ontario, Canada; No Copyright; Avail: CASI; [A02](#), Hardcopy

The International Space Station (ISS) ham radio system has been on-orbit for over 3 years. Since its first use in November 2000, the first seven expedition crews and three Soyuz taxi crews have utilized the amateur radio station in the Functional Cargo Block (also referred to as the FGB or Zarya module) to talk to thousands of students in schools, to their families on

Earth, and to amateur radio operators around the world. Early on, the Amateur Radio on the International Space Station (ARISS) international team devised a multi-phased hardware development approach for the ISS ham radio station. Three internal development Phases. Initial Phase 1, Mobile Radio Phase 2 and Permanently Mounted Phase 3 plus an externally mounted system, were proposed and agreed to by the ARISS team. The Phase 1 system hardware development which was started in 1996 has since been delivered to ISS. It is currently operational on 2 meters. The 70 cm system is expected to be installed and operated later this year. Since 2001, the ARISS international team have worked to bring the second generation ham system, called Phase 2, to flight qualification status. At this time, major portions of the Phase 2 hardware system have been delivered to ISS and will soon be installed and checked out. This paper intends to provide an overview of the Phase 1 system for background and then describe the capabilities of the Phase 2 radio system. It will also describe the current plans to finalize the Phase 1 and Phase 2 testing in Russia and outlines the plans to bring the Phase 2 hardware system to full operation.

Author

Systems Engineering; Zarya Control Module; Electronic Modules; Broadcasting

34

FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20040008872 NASA Langley Research Center, Hampton, VA, USA

Real-Time Adaptive Control of Flow-Induced Cavity Tones

Kegerise, Michael A.; Cabell, Randolph H.; Cattafesta, Louis N.; [2004]; 13 pp.; In English

Report No.(s): AIAA Paper 2004-0572; No Copyright; Avail: CASI; [A03](#), Hardcopy

An adaptive generalized predictive control (GPC) algorithm was formulated and applied to the cavity flow-tone problem. The algorithm employs gradient descent to update the GPC coefficients at each time step. The adaptive control algorithm demonstrated multiple Rossiter mode suppression at fixed Mach numbers ranging from 0.275 to 0.38. The algorithm was also able to maintain suppression of multiple cavity tones as the freestream Mach number was varied over a modest range (0.275 to 0.29). Controller performance was evaluated with a measure of output disturbance rejection and an input sensitivity transfer function. The results suggest that disturbances entering the cavity flow are colocated with the control input at the cavity leading edge. In that case, only tonal components of the cavity wall-pressure fluctuations can be suppressed and arbitrary broadband pressure reduction is not possible. In the control-algorithm development, the cavity dynamics are treated as linear and time invariant (LTI) for a fixed Mach number. The experimental results lend support this treatment.

Author

Real Time Operation; Adaptive Control; Flow Characteristics; Cavities; Algorithms

20040010325 NASA Langley Research Center, Hampton, VA, USA

Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers

Lee-Rausch, E. M.; Frink, N. T.; Mavriplis, D. J.; Rausch, R. D.; Milholen, W. E.; [2004]; 29 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA

Report No.(s): AIAA Paper 2004-0554; Copyright; Avail: CASI; [A03](#), Hardcopy

A second international AIAA Drag Prediction Workshop (DPW-II) was organized and held in Orlando Florida on June 21-22, 2003. The primary purpose was to investigate the code-to-code uncertainty, address the sensitivity of the drag prediction to grid size and quantify the uncertainty in predicting nacelle/pylon drag increments at a transonic cruise condition. This paper presents an in-depth analysis of the DPW-II computational results from three state-of-the-art unstructured grid Navier-Stokes flow solvers exercised on similar families of tetrahedral grids. The flow solvers are USM3D - a tetrahedral cell-centered upwind solver, FUN3D - a tetrahedral node-centered upwind solver, and NSU3D - a general element node-centered central-differenced solver. For the wingbody, the total drag predicted for a constant-lift transonic cruise condition showed a decrease in code-to-code variation with grid refinement as expected. For the same flight condition, the wing/body/nacelle/pylon total drag and the nacelle/pylon drag increment predicted showed an increase in code-to-code variation with grid refinement. Although the range in total drag for the wingbody fine grids was only 5 counts, a code-to-code comparison of surface pressures and surface restricted streamlines indicated that the three solvers were not all converging to the same flow solutions- different shock locations and separation patterns were evident. Similarly, the wing/body/nacelle/pylon solutions did not appear to be converging to the same flow solutions. Overall, grid refinement did not consistently improve

the correlation with experimental data for either the wingbody or the wing/body/nacelle pylon configuration. Although the absolute values of total drag predicted by two of the solvers for the medium and fine grids did not compare well with the experiment, the incremental drag predictions were within plus or minus 3 counts of the experimental data. The correlation with experimental incremental drag was not significantly changed by specifying transition. Although the sources of code-to-code variation in force and moment predictions for the three unstructured grid codes have not yet been identified, the current study reinforces the necessity of applying multiple codes to the same application to assess uncertainty.

Author

Drag; Unstructured Grids (Mathematics); Transonic Flight; Cruising Flight; Wing Nacelle Configurations; Computational Fluid Dynamics

20040010360 NASA Ames Research Center, Moffett Field, CA, USA

A New Modular Approach for Tightly Coupled Fluid/Structure Analysis

Guruswamy, Guru; November 24, 2003; 8 pp.; In English; AIAA MDO Conference, September 2004, Albany, NY, USA; No Copyright; Avail: CASI; A02, Hardcopy

Static aeroelastic computations are made using a C++ executive suitable for closely coupled fluid/structure interaction studies. The fluid flow is modeled using the Euler/Navier Stokes equations and the structure is modeled using finite elements. FORTRAN based fluids and structures codes are integrated under C++ environment. The flow and structural solvers are treated as separate object files. The data flow between fluids and structures is accomplished using I/O. Results are demonstrated for transonic flow over partially flexible surface that is important for aerospace vehicles. Use of this development to accurately predict flow induced structural failure will be demonstrated.

Author

Aerospace Vehicles; Fluid Flow; Computational Fluid Dynamics; Structural Analysis; Distributed Processing; Mathematical Models; Aeroelasticity

20040010660 Wisconsin Univ., Madison, WI, USA, Lawrence Livermore National Lab., Livermore, CA, General Atomics Co., San Diego, CA

Experimental Characterization of Coherent, Radially-Sheared Zonal Flows in the DIII-D Tokamak

McKee, G. R.; Fonck, R. J.; Jakubowski, M.; Burrell, K. H.; Hallatschek, K.; Nov. 2002; 36 pp.; In English Report No.(s): DE2003-814000; GA-A24216; No Copyright; Avail: Department of Energy Information Bridge

Application of time-delay-estimation techniques to two-dimensional measurements of density fluctuations, obtained with beam emission spectroscopy in DIII-D plasmas, has provided temporally and spatially resolved measurements of the turbulence flow-field. Features that are characteristic of self-generated zonal flows are observed in the radial region near $0.85(\text{less than or } \leq) r/a(\text{less than or } \leq) 1.0$. These features include a coherent oscillation (approximately 15 kHz) in the poloidal flow of density fluctuations that has a long poloidal wavelength, possibly $m=0$, narrow radial extent ($k_r(\rho)/I$ less than 0.2), and whose frequency varies monotonically with the local temperature. The approximate effective shearing rate, $dv(\theta)/dr$, of the flow is of the same order of magnitude as the measured nonlinear decorrelation rate of the turbulence, and the density fluctuation amplitude is modulated at the frequency of the observed flow oscillation. Some phase coherence is observed between the higher wavenumber density fluctuations and low frequency poloidal flow fluctuations, suggesting a Reynolds stress contribution. These characteristics are consistent with predicted features of zonal flows, specifically identified as geodesic acoustic modes, observed in 3-D Braginskii simulations of core/edge turbulence.

NTIS

Tokamak Devices; Acoustic Properties; Emission Spectra

20040010781 NASA Marshall Space Flight Center, Huntsville, AL, USA

Magnetic Control of Solutal Buoyancy-driven Convection, Part 1, Theory and Experiments

Ramachandran, N.; Leslie, F. W.; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Experiments on solutal convection in a paramagnetic fluid were conducted in a strong magnetic field gradient using a dilute solution of Manganese Chloride. The observed flows indicate that the magnetic field can completely counter the settling effects of gravity locally and are consistent with the theoretical predictions presented.

Derived from text

Buoyancy-Driven Flow; Convection; Magnetic Control; Solutes

20040010859 Army Tank-Automotive and Armaments Command, Warren, MI

Spreadsheet Accumulator Sizing for Hybrid Hydraulic Applications Using the Benedict-Webb-Rubin Equation of State

Bylsma, Wesley; Sep. 2003; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419344; AMSTA-QH-13942; No Copyright; Avail: CASI; [A03](#), Hardcopy

A simple and effective method using optimization with the Benedict-Webb-Rubin equation of state is presented to size accumulator volumes in hybrid hydraulic applications given the pre-charge, minimum and maximum operating pressures.

DTIC

Accumulators; Equations of State; Hydraulics

20040010866 Naval Surface Warfare Center, Bethesda, MD

Marine Vortices and Their Computation

Gorski, Joseph J.; Mar. 2003; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418982; No Copyright; Avail: CASI; [A03](#), Hardcopy

No abstract available

Vortices; Submarines; Ships

20040010870 Tetra Tech, Inc., San Diego, CA

Hydrotechnics in Situ Flow Sensor

Sep. 2001; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): 68-C5-0037

Report No.(s): AD-A418952; No Copyright; Avail: CASI; [A03](#), Hardcopy

The U.S. Environmental Protection Agency (EPA) Superfluid Innovative Technology Evaluation (SITE) Program evaluated performance of HydroTechnics, Inc. flow sensors in measuring the three-dimensional flow pattern created by operation of the Wasatch Environmental, Inc. (WEI) groundwater circulation well (GCW). The GCW is a dual-screened, in-well air-stripping system designed to remove volatile organic compounds (VOC) from groundwater. Operation of the GCW creates a groundwater flow pattern that forms a three-dimensional regime known as a 'circulation cell.' EPA's evaluation of the GCW circulation cell involved use of in situ groundwater velocity flow sensors that were developed at Sandia National Laboratories and manufactured by HydroTechnics, Inc.

DTIC

Water Flow; Ground Water; Sensors; Flow Measurement; Three Dimensional Flow

20040010875 Harvard Univ., Cambridge, MA

Nonlinear Dynamics and Ergodic Theory Methods in Control

Mezic, Igor; Jan. 2003; 15 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0361

Report No.(s): AD-A418975; AFRL-SR-AR-TR-03-0491; No Copyright; Avail: CASI; [A03](#), Hardcopy

We have continued to work on control of complex nonlinear systems and pursued applications to control of mixing, control of nanoscale processes and control of microscale mixing. At the PI's group, 1 graduate student (Umesh Vaidya) was working on the problem of control of discrete-time, conservative systems and quantum control. Another student (Zoran Levnajic%) worked on problems in visualization of dynamical systems. A postdoctoral student (Dmitri Vainchtein) continued working on the problem of flow control using tools from dynamical systems theory and vortex dynamics and pursued a problem in control of nanoparticle separation. The PI worked on ergodic theory methods for control of systems with drift and optimization of mixing in a paper appeared in the journal Nature. The PI also worked extending the framework for model validation of Random Dynamical Systems in the framework of the Koopman operator developed into dynamical systems treatment of uncertainty analysis.

DTIC

Fluid Flow; Nonlinear Systems; Dynamical Systems

20040012578 ZONA TECHNOLOGY INC SCOTTSDALE AZ, Scottsdale, AZ, USA

Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store

Chen, P. C.; Liu, Danny D.; Geo, Xiaowei; Hall, Kenneth C.; Dowell, Earl H.; Dec. 2003; 148 pp.; In English

Contract(s)/Grant(s): F49620-01-C-0029

Report No.(s): AD-A419161; ZONA-03-45; No Copyright; Avail: CASI; [A07](#), Hardcopy

Significant progress has been made by the ZONA- Duke team in Phase II of our work. A novel and computationally efficient method for calculating transonic limit cycle oscillations (LCO), flutter and other nonlinear aeroelastic phenomena has been developed. To solve the general 3D Euler and Reynolds Averaging Navier-Stokes(Euler/RANS) equation, a Harmonic Balance(HB) method formulated in the frequency domain in combination with a proper orthogonal decomposition (POD) technique and reduced order modeling (ROM) has been developed and demonstrated on several challenging examples relevant to the Air Force. Various 2D and 3D cases for Euler/RANS have been studied including the conventional NACA 64A10 airfoil, the supercritical NAL7301 airfoil, the AGARD 445.6 wing and the F-16 wing/store system with the actual structural modes provided by an industry/Air Force team.

DTIC

F-16 Aircraft; Nonlinearity; Oscillations; Wings; Transonic Flight

20040012609 NASA Marshall Space Flight Center, Huntsville, AL, USA

High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures

Tucker, Jim; Despit, Gregory; Stallcup, Michael; Presson, Joan; Nein, Max; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

A new, interferometer-based system for measuring thermal expansion to an absolute accuracy of 20 ppb or better at cryogenic temperatures has been developed. Data from NIST Copper SRM 736 measured from room temperature to 15 K will be presented along with data from many other materials including beryllium, ULE, Zerodur, and composite materials. Particular attention will be given to a study by the Space Optics Manufacturing Technology Center (SOMTC) investigating the variability of ULE and beryllium materials used in the AMSD program. Approximately 20 samples of each material, tested from room temperature to below 30 K are compared as a function of billet location.

Author

Cryogenic Temperature; Thermal Expansion; Accuracy; Interferometers

20040012684 NASA Ames Research Center, Moffett Field, CA, USA

Task Assignment Heuristics for Parallel and Distributed CFD Applications

Lopez-Benitez, Noe; Djomehri, M. Jahed; Biswas, Rupak; November 1, 2003; 18 pp.; In English

Contract(s)/Grant(s): WBS 302-15-41; Copyright; Avail: CASI; [A03](#), Hardcopy

This paper proposes a task graph (TG) model to represent a single discrete step of multi-block overset grid computational fluid dynamics (CFD) applications. The TG model is then used to not only balance the computational workload across the overset grids but also to reduce inter-grid communication costs. We have developed a set of task assignment heuristics based on the constraints inherent in this class of CFD problems. Two basic assignments, the smallest task first (STF) and the largest task first (LTF), are first presented. They are then systematically costs. To predict the performance of the proposed task assignment heuristics, extensive performance evaluations are conducted on a synthetic TG with tasks defined in terms of the number of grid points in predetermined overlapping grids. A TG derived from a realistic problem with eight million grid points is also used as a test case.

Author

Computational Grids; Computational Fluid Dynamics; Heuristic Methods; Parallel Processing (Computers)

20040012810 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Thermal Vacuum Testing of Swift XRT Ethane Heat Pipes

Kobel, Mark; Ku, Jentung; [2003]; 8 pp.; In English; 1st International Energy Conversion Conference, 17-21 Aug. 2003, Portsmouth, VA, USA; No Copyright; Avail: CASI; [A02](#), Hardcopy

This paper presents the results obtained from a recent ethane heat pipe program. Three identical ethane heat pipes were tested individually, and then two selected heat pipes were tested collectively in their system configuration. Heat transport, thermal conductance, and non-condensable gas tests were performed on each heat pipe. To gain insight into the reflux operation as seen at spacecraft level ground testing, the test fixture was oriented in a vertical configuration. The system level test included a computer-controlled heater designed to emulate the heat load generated at the thermoelectric cooler interface. The system performance was successfully characterized for a wide range of environmental conditions while staying within the operating limits.

Derived from text

Thermal Conductivity; Vacuum; Ethane; Heat Pipes; Ground Tests; Heat Transfer

20040012878 Princeton Univ., NJ

Circulation in a Short Cylindrical Couette System

Kageyama, A.; Ji, H.; Goodman, J.; Jul. 2003; 40 pp.; In English

Report No.(s): DE2003-814703; PPPL-3836; No Copyright; Avail: Department of Energy Information Bridge

In preparation for an experimental study of magnetorotational instability (MRI) in liquid metal, we explore Couette flows having height comparable to the gap between cylinders, centrifugally stable rotation, and high Reynolds number.

NTIS

Couette Flow; Cylindrical Bodies

20040012909 Swedish Defence Research Establishment, Linköping

FOI/FFA 2002 Research on Missiles, Stealth Technology and UAVs, Complementary FMV 250180-LB604516

Gustafsson, A.; Dec. 2002; In Swedish

Report No.(s): PB2004-100956; FOI-R-0731-SE; Copyright; Avail: National Technical Information Service (NTIS)

The reported work has been conducted to raise the level of knowledge and maintain skills required for future Air Vehicles projects mainly directed towards missiles, stealth technology and UAVs.

NTIS

Stealth Technology; Missiles

20040012935 Mississippi State Univ., Mississippi State, MS, USA

Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows

Sreenivas, K.; Hyams, D.; Mitchell, B.; Taylor, L.; Briley, W. R.; Mar. 2003; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419117; No Copyright; Avail: CASI; [A03](#), Hardcopy

An understanding of Reynolds number effects is essential for extrapolating model- or quarter-scale results to full-scale. The state-of-the-art in the prediction of full-scale maneuvering performance utilizes a combination of experience, heuristics, and empiricism. To better understand these scale effects, it would be ideal to validate the flow solver at full-scale Reynolds numbers. However, the preponderance of experimental data available for undersea vehicles is limited to model-scale. The unavailability of full-scale data prevents a thorough validation of the high Reynolds number capabilities, but basic validation can be achieved using flat plate boundary layer results and Reynolds number scaling. This study investigates the differences in the computed flow fields between model-, quarter-, and full-scale Reynolds numbers. Towards this end, an efficient RANS incompressible flow solver, U2NCLE, which is capable of performing viscous high Reynolds number flow simulations for complex geometries using unstructured grids, has been developed. This flow solver is to be demonstrated for large-scale meshes with good sub-layer resolution ($y^+(exp) < 1$) and approximately 10^6 points or more with an emphasis toward hydrodynamic applications. Results are shown for model-, quarter-, and full-scale computations on the SUBOFF model with sail at various angles of drift. Effects of grid density on computed flow fields at model-scale and full-scale Reynolds numbers also are considered. (13 figures, 10 refs.)

DTIC

Vortices; Computational Fluid Dynamics; Flow Distribution; Hydrodynamics; Reynolds Number; Incompressible Flow

20040012936 Army Engineer Research and Development Center, IL, USA

Compressed Air System Survey at Army Industrial Facilities

Lin, Mike C.; Lorand, Robert T.; Presny, Doug; Westerman, John F.; Aylor, Stephen W.; Jan. 2003; 230 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-40162784AT45

Report No.(s): AD-A419140; ERDC/CERL-TR-03-1; No Copyright; Avail: CASI; [A11](#), Hardcopy

Compressed air (CA) is an indispensable commodity used in manufacturing and maintenance facilities. As in the private sector, Department of Defense (DOD) facilities make widespread use of air compressors. Although CA is a convenient power source, CA systems are not cheap to operate. An analysis of the cost breakdown of a CA system shows that as little as 10 percent of the input power supplied to the compressor is delivered as CA to the system. The electricity used by these air compressors is a major contributor to annual energy operating costs. The use of natural gas engine driven air compressors (NGEDACs) in place of conventional electric motor driven air compressors offers an opportunity to reduce these costs. The savings offered by this alternative technology can more than offset the capital and maintenance costs of its installation. This survey was undertaken to evaluate CA systems at Army industrial facilities to identify opportunities for energy savings by

improving system efficiencies and by identifying suitable candidates for installation of NGEDACs.

DTIC

Compressed Air; Defense Program; Compressors

35

INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20040008888 Smithsonian Astrophysical Observatory, Cambridge, MA, USA

Measurement of Precision Geometric Distances to Three Anchor Points in the Local Universe

Reid, Mark J.; December 2003; 3 pp.; In English

Contract(s)/Grant(s): NAG5-10311; No Copyright; Avail: CASI; [A01](#), Hardcopy

As stated in previous reports, our program, funded by a NASA/SARA 3-yr grant, is designed to measure distances directly with accuracies of 5% to three anchor points in the Local Universe. We are attacking this problem on three fronts, using Very Long Baseline Interferometry (VLBI) observations of NGC 4258, M 33, and Sgr A*. We plan to provide distance estimates, with a minimum of systematic uncertainty, that can be used to re-calibrate several 'standard candles,' such as Cepheid and RR Lyrae variables. This will place the Galactic and extragalactic distance scales on much firmer ground. The program will provide crucial, independent checks and calibrations of extragalactic distance measurements, and will contribute to the ultimate success and impact of the HST Key Project on Extragalactic Distances and any future NASA astrometric missions. Additionally, since distances are fundamental to astrophysics, our results will affect a large number of general projects on NASA facilities such as the HST, CXO, and JWST.

Derived from text

Dimensional Measurement; Astrometry; Distance; Universe

20040008895 NASA Stennis Space Center, Bay Saint Louis, MS, USA

Radiant Temperature Nulling Radiometer and Polarization Enhanced Thermal Radiometer

Bailey, John; March 17, 2002; 29 pp.; In English; PITTCON 2002: New Product Forum, 17 Mar. 2002

Report No.(s): SE-2002-03-00016-SSC; SSC-00124; SSC-00134; No Copyright; Avail: CASI; [A03](#), Hardcopy

The two radiometers profiled in this viegraph presentation, the Radiant Temperature Nulling Radiometer and the Polarization Enhanced Thermal Radiometer, were developed for the calibration of remote sensing equipment. This presentation profiles the theory and components of each type of radiometer.

CASI

Radiometers; Calibrating; Remote Sensors; Product Development

20040010531 NASA Stennis Space Center, Bay Saint Louis, MS, USA

Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+

Blonski, Slawomir; Glasser, Gerald; Russell, Jeffrey; Ryan, Robert; Terrie, Greg; Zandoni, Vicki; [2003]; 32 pp.; In English

Contract(s)/Grant(s): NAS13-650

Report No.(s): SE-2002-02-00012-SSC; No Copyright; Avail: CASI; [A03](#), Hardcopy

Spectral band synthesis is a key step in the process of creating a simulated multispectral image from hyperspectral data. In this step, narrow hyperspectral bands are combined into broader multispectral bands. Such an approach has been used quite often, but to the best of our knowledge accuracy of the band synthesis simulations has not been evaluated thus far. Therefore, the main goal of this paper is to provide validation of the spectral band synthesis algorithm used in the ART software. The next section contains a description of the algorithm and an example of its application. Using spectral responses of AVIRIS, Hyperion, ALI, and ETM+, the following section shows how the synthesized spectral bands compare with actual bands, and it presents an evaluation of the simulation accuracy based on results of MODTRAN modeling. In the final sections of the paper, simulated images are compared with data acquired by actual satellite sensors. First, a Landsat 7 ETM+ image is simulated using an AVIRIS hyperspectral data cube. Then, two datasets collected with the Hyperion instrument from the EO-1

satellite are used to simulate multispectral images from the ALI and ETM+ sensors.

Author (revised)

Satellite Observation; Image Processing; Multispectral Photography

20040010752 Wright State Univ., Dayton, OH

Synthetic Aperture Radar (SAR) Automatic Target Recognition (ATR) parametric Study

Xue, Kefu; Sink, Sam; Feb. 2003; 107 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-01-C-1852; Proj-6095

Report No.(s): AD-A418766; AFRL-SN-WP-TR-2003-1174; No Copyright; Avail: CASI; [A06](#), Hardcopy

SAR ATR is a very complex problem that still has not been mastered. SAR ATR is difficult largely due to the fact that SAR imagery exhibits large variability. SAR imagery is a function of many variables called operating conditions (OCs) that can be subdivided into three large groups. The three main OCs are target, environment, and sensor. Sensor operating conditions deal with the properties of the sensor that have some of the largest effects on the formation of SAR images, including depression angle, squint angle, frequency, PRF, polarization, single/multi-look, sensor abnormalities, noise level, strip versus spot, and resolution. In the development and testing of SAR ATR algorithms to date the effects of sensor OCs have been given very little thought. The ultimate objective of this study is to develop a road map for studying various effects of varying sensor OCs on the performance of SAR ATR algorithms. For achieving this goal, we conducted literature searches to see how much had been done in sensor OC study. We also studied alternative data sources and the ways to generate SAR data related to the variation of sensor OCs to support SAR parametric study. In addition, we allocated and implemented a number of baseline ATR algorithms for the evaluation of their performance under the variation of sensor OCs. Our research has established an experimental paradigm for SAR parametric study.

DTIC

Target Recognition; Synthetic Aperture Radar

20040010803 ManTech Environmental Technology, Inc., Research Triangle Park, NC, USA

Guidelines for the Application of SEM/EDX Analytical Techniques to Particulate Matter Samples

Willis, R. D.; Blanchard, F. T.; Conner, T. L.; Sep. 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM and paper only. CD-ROM contains a 128 page document

Report No.(s): PB2004-100988; EPA/600/R-02/070; No Copyright; Avail: National Technical Information Service (NTIS)

Scanning Electron Microscopy (SEM) coupled with Energy-Dispersive X-ray analysis (EDX) is a powerful tool in the characterization and source apportionment of environmental particulate matter (PM), providing use, chemistry, and morphology of particles as small as a few tenths of a micron. Such information can reveal information about emission sources which cannot be determined through bulk chemical analysis. Automated SEMs capable of routinely analyzing hundreds of particles per hour have dramatically increased the throughput of SEM/EDX, making it feasible to conduct statistically meaningful analyses of PM samples and to generate large data sets for source apportionment studies. The National Exposure Research Laboratory (NERL) of the U.S. EPA has been developing and evaluating the use of SEM/EDX to characterize ambient and source-derived particles. The present document, which evolved over several years as a product of research carried out in support of the U.S. EPA/NERL SEM/EDX Laboratory, is intended to provide guidelines for researchers using SEM/EDX for aerosol characterization and source apportionment. Topics include laboratory procedures for sample handling, sample preparation, guidelines for successful manual and automated SEM/EDX analyses, data interpretation, issues relating to data quality and method validation, and case studies highlighting the use of SEM/EDX in PM research.

NTIS

Particulates; Particulate Sampling; Scanning Electron Microscopy; X Ray Analysis

20040010863 NASA Ames Research Center, Moffett Field, CA, USA

SOFIA First Generation Science Instruments

Erickson, Edwin F.; Meyer, Allan W.; [2003]; 1 pp.; In English; Dense Interstellar Medium in Galaxies, 22-26 Sep. 2003, Zermatt, Switzerland; Copyright; Avail: Other Sources; Abstract Only

SOFIA will provide 0.3- 1600 pm wavelength coverage, excellent FIR/submm angular resolution, a variety of focal plane instruments, and access to them throughout a 20-year lifetime. These attributes assure SOFIA a vital role in future observations of the interstellar medium, and in numerous other studies. SOFIA is a joint program of NASA in the U.S. and DLR in Germany. Observing time will be arranged by annual peer review of proposals, with roughly 80 percent of the time granted

by the U.S. and 20 percent of the time granted by Germany. International proposals may be submitted to either time allocation committee. SOFIA is expected to begin science flights in 2005.

Author

Sofia (Airborne Observatory); Infrared Instruments; NASA Space Programs; Aerospace Sciences

20040012773 NASA Ames Research Center, Moffett Field, CA, USA

Automated Data Processing as an AI Planning Problem

Golden, Keith; Pang, Wanlin; Nemani, Ramakrishna; Votava, Petr; [2003]; 8 pp.; In English; 14th International Conference on Automated Planning and Scheduling, 3-7 Jun. 2004, Whistler, British Columbia, Canada; Copyright; Avail: CASI; [A02](#), Hardcopy

NASA's vision for Earth Science is to build a 'sensor web'; an adaptive array of heterogeneous satellites and other sensors that will track important events, such as storms, and provide real-time information about the state of the Earth to a wide variety of customers. Achieving this vision will require automation not only in the scheduling of the observations but also in the processing of the resulting data. To address this need, we have developed a planner-based agent to automatically generate and execute data-flow programs to produce the requested data products. Data processing domains are substantially different from other planning domains that have been explored, and this has led us to substantially different choices in terms of representation and algorithms. We discuss some of these differences and discuss the approach we have adopted.

Author

Data Processing; Information Flow; Heterogeneity; Earth Sciences; Algorithms; Sensors

20040012904 National Defence Research Establishment, Linköping, Sweden

Efficient Region Tracking and Target Position Estimation in Image Sequences using Kalman Filters

Sep. 2002; In English

Report No.(s): PB2004-101725; FOI-R-0595-SE; No Copyright; Avail: National Technical Information Service (NTIS)

In recent years there has been an ever-growing interest for the concept of Unmanned Aerial Vehicles, UAV's, and large research efforts are invested in this area today. One major field of application for such systems equipped with electro-optical imaging systems is aerial surveillance and reconnaissance, and for this purpose more autonomous sensor systems equipped with robust and efficient target tracking algorithms are needed. In this thesis, such a tracking algorithm has been studied and improved by the incorporation of an efficient Kalman filter. The result is a robust tracking algorithm that has been implemented in efficient C++ code and made to work in real-time to perform image based control on an experimental camera system platform developed in the SIREOS project at FOI. The thesis has also been concerned with the development of an algorithm for position estimation (geolocation) of stationary and moving ground targets. The position of a stationary target is estimated by iterative triangulation in a global reference system, based on sequential data from the tracking algorithm and the platform navigation system. For the purpose of tracking moving ground targets, a measure of the tracking quality of an image reference region has been developed as well. This measure will allow for an autonomous choice of reference regions to track and geolocate in image sequences. Such geolocated stationary regions generate a reference system that admits geolocation of moving ground targets.

NTIS

Kalman Filters; Image Processing; Tracking (Position); Target Acquisition

20040012928 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Global Multispectral Cloud Retrievals from MODIS

King, Michael D.; Platnick, Steven; Ackerman, Steven A.; Menzel, W. Paul; Riedi, Jerome C.; Baum, Bryan A.; [2003]; 1 pp.; In English; International Geoscience and Remote Sensing Symposium, 21-25 Jul. 2003, Toulouse, France; Copyright; Avail: Other Sources; Abstract Only

The Moderate Resolution Imaging Spectroradiometer (MODIS) was developed by NASA and launched onboard the Terra spacecraft on December 18, 1999 and Aqua spacecraft on May 4, 2002. It achieved its final orbit and began Earth observations on February 24, 2000 for Terra and June 24, 2002 for Aqua. A comprehensive set of remote sensing algorithms for cloud masking and the retrieval of cloud physical and optical properties has been developed by members of the MODIS atmosphere science team. The archived products from these algorithms have applications in climate change studies, climate modeling, numerical weather prediction, as well as fundamental atmospheric research. In addition to an extensive cloud mask, products include cloud-top properties (temperature, pressure, effective emissivity), cloud thermodynamic phase, cloud optical and microphysical parameters (optical thickness, effective particle radius, water path), as well as derived statistics. We will

describe the various cloud properties being analyzed on a global basis from both Terra and Aqua, and will show characteristics of cloud optical and microphysical properties as a function of latitude for land and ocean separately, and contrast the statistical properties of similar cloud types in various parts of the world.

Author

Numerical Weather Forecasting; Imaging Spectrometers; Statistical Distributions; Cloud Physics

20040012932 Rochester Univ., NY, USA

Electronic Imaging: Propagation, Retrieval, Recognition

George, Nicholas; Dec. 12, 2003; 7 pp.; In English

Contract(s)/Grant(s): DAAD19-00-1-0551

Report No.(s): AD-A419112; 309/00-03; ARO-41230.1-PH; No Copyright; Avail: CASI; [A02](#), Hardcopy

This is the final report for a balanced program of theoretical and experimental research that has been conducted in order to discover and demonstrate novel emerging electronic imaging systems. Electronic imaging systems combine optical image acquisition and photosensor arrays with digital computers and displays. This combination leads to systems which are capable of remarkable performance, hence the designation smart cameras. Smart cameras are systems that see and think. During this program, we have made excellent progress on several projects and graduated two doctoral scholars. Papers were published on GRIN array imaging, holography of nonrigid objects, holographic interference filters for infrared communications, and extended depth of field by tenfold using our novel logarithmic asphere lens. Important image science publications include an extension to the Whitaker-Shannon sampling theory. Three patents were filed or granted: Imaging through turbulence, wide angle uniform diffusing screens, and the logarithmic asphere lens.

DTIC

Holography; Optical Communication; Cameras; Photoelectricity; Images

20040012956 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Satellites as Sentinels for Climate and Health

Maynard, Nancy G.; [2003]; 1 pp.; In English; World Climate Change Conference, 29 Sep. - 3 Oct. 2003, Moscow, Russia; No Copyright; Avail: Other Sources; Abstract Only

Remotely-sensed data and observations are providing powerful new tools for addressing climate and environment-related human health problems through increased capabilities for monitoring, risk mapping, and surveillance of parameters useful to such problems as vector-borne and infectious diseases, air and water quality, harmful algal blooms, W radiation, contaminant and pathogen transport in air and water, and thermal stress. Remote sensing, geographic information systems (GIS), global positioning systems (GPS), improved computation capabilities, and interdisciplinary research between the Earth and health science communities, together with local knowledge, are being combined in rich collaborative efforts resulting in more rapid problem-solving, early warning, and prevention in global climate and health issues. These collaborative efforts are enabling increased understanding of the relationships among changes in temperature, rainfall, wind, soil moisture, solar radiation, vegetation, and the patterns of extreme weather events and health issues. This increased understanding and improved information and data sharing, in turn, empowers local health and environmental decision-makers to better predict climate-related health problems, decrease vulnerability, take preventive measures, and improve response actions. This paper provides a number of recent examples of how satellites - from their unique vantage point in space - can serve as sentinels for climate and health.

Author

Climatology; Computation; Contaminants; Early Warning Systems; Global Positioning System; Health; Infectious Diseases; Problem Solving; Remote Sensing

20040012968 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Continuous Cooling from 10 K to 4 K Using a Toroidal ADR

DiPirro, Michael J.; Canavan, Edgar R.; Shirron, Peter J.; Tuttle, James G.; [2003]; 1 pp.; In English; Space Cryogenics Workshop, 18-19 Sep. 2003, Girdwood, AK, USA; No Copyright; Avail: Other Sources; Abstract Only

Future large infrared space telescopes will require cooling to 4K to achieve background limited performance for submillimeter wavelengths. These observatories will require lifetimes of many years and will have relatively large cooling requirements making stored helium dewars impractical. We have designed and are building an adiabatic demagnetization refrigerator (ADR) for use in cooling relatively large loads (10- 100 mW) at 4K and rejecting that heat to a cryocooler operating at 1 OK. Cryocoolers below 1 OK have poor thermodynamic efficiency and ADRs can operate in this temperature

range with an efficiency of 75% of Carnot or better. Overall, this can save as much as 2/3 of the input power required to operate a 4K cryocooler. The ADR magnet consists of 8 short coils wired in series and arranged in a toroid to provide self shielding of its magnetic field. This will save mass (about 30% of the mass or about 1.5 kg in our small version, higher percentages in higher cooling power, larger versions) that would have been used for passive or active shields in an ordinary solenoid. The toroid has a 100 mm outer diameter and will produce an approximately 3T average field. In the initial demonstration model the toroid coils will be wound with ordinary NbTi wire and operated at 4K. A second version will then use Nb₃Sn wire to provide complete 10K operation. As a refrigerant for this temperature range we will use either GdLiF₄ or GdF₃ crystals, pending tests of these crystals' cooling capacity per field and thermal conductance. Preliminary indications are that these materials are superior to GGG. We will use gas gap heat switches to alternately connect the toroid to the cold load and the warm heat sink. A small continuous stage will maintain the cold end at 4K while the main toroid is recycled.

Author

Adiabatic Conditions; Coolers; Cryogenic Cooling; Hubble Space Telescope; Infrared Telescopes; Magnetic Cooling; Shielding; Thermodynamic Efficiency

20040012993 Army Test and Evaluation Command, Aberdeen Proving Ground, MD

Standardized UXO Technology Demonstration Site Blind Grid Scoring Record No. 50. Site Location: Aberdeen Proving Ground

Overbay, Larry; Oct. 2003; 39 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418974; ATC-8691; No Copyright; Avail: CASI; [A03](#), Hardcopy

This scoring record documents the efforts of GEOPHEX, Ltd. to detect and discriminate inert unexploded ordnance (UXO) utilizing the APG Standardized UXO Technology Demonstration Site Blind Grid. The scoring record was written by Larry Overbay utilizing methodology coordinated with the Standardized UXO technology Demonstration Site Program Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental Security Technology Certification Program, the Strategic Environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center.

DTIC

Ordnance; Certification; Engineers

36

LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20040010401 New Mexico Univ., Albuquerque, NM

High Power Mid-IR Semiconductor Lasers for LADAR

Lester, Luke F.; Nov. 26, 2003; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-99-1-1023

Report No.(s): AD-A419059; 310571FT; No Copyright; Avail: CASI; [A03](#), Hardcopy

The growing need for antimonide-based, room temperature, 2-5 micrometers, semiconductor lasers for trace gas spectroscopy, ultra-low loss communication, infrared countermeasures, and ladar motivated this work. To extend the wavelength of semiconductor lasers beyond 2 micrometers, increased arsenic content has been needed to reduce the bandgap and maintain a lattice match to GaSb. This has resulted in degraded performance due in part to a smaller valence band offset. In this work, the need for lattice match between the active region and the GaSb substrate is avoided by the use of metamorphic AlInSb buffer layers. This provides a virtual substrate to extend the wavelength of GaInSb quantum wells. With the use of lattice constants larger than GaSb, the need for arsenic has been eliminated resulting in pure antimonide crystals, which provides for large valence band offsets. Samples are grown by solid source molecular beam epitaxy. The AlInSb metamorphic buffer layer is a superlattice consisting of alternating layers of Al_xIn_{1-x}Sb and Al_yIn_{1-y}Sb where the indium content and thickness ratios are chosen to provide the desired average indium content. Using these buffer layers, optically pumped GaInSb/AlGaInSb multiple quantum well lasers with as much as 76% indium content in the quantum well and emission wavelength as long as 3.3 micrometers at room temperature have been achieved. The best performing room temperature laser

emits at 2.8 micrometers with a threshold power density of 169 W/cm² and a differential quantum efficiency of 28%.
DTIC

Semiconductor Lasers; Infrared Radiation; Metamorphism (Geology)

20040010484

Perturbation Expansion for High-Gain Free-Electron Laser Saturation

Krinsky, S.; Jan. 2003; 32 pp.; In English

Report No.(s): DE2003-812610; SLAC-PUB-9619; No Copyright; Avail: Department of Energy Information Bridge

The authors develop a perturbation expansion for the solution of the nonlinear one-dimensional free-electron laser equations. For a monochromatic wave, the radiation field is expanded in a Taylor series having a finite radius of convergence. Analytic continuation using Padé' approximates yields accurate results well into the saturation regime. We also formulate the perturbation expansion for finite bandwidth, self-amplified spontaneous-emission (SASE), and determine the lowest order correction to the well-known linear theory. Motivated by an approximation to the expansion coefficients, we introduce a simplified model for the SASE radiation field, and use it to discuss SASE statistics in the saturation regime, before the onset of the sideband instability.

NTIS

Free Electron Lasers; Saturation

20040010535 Naval Research Lab., Washington, DC

Preliminary Observations Regarding LDV Scans of Panels Excited by Broadband Actuators at the US Capitol

Bucaro, J. A.; Vignola, J.; Houston, B. H.; Romano, A. J.; Nov. 7, 2003; 54 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418869; NRL/MR/7130--03-8685; No Copyright; Avail: CASI; [A04](#), Hardcopy

Experiments were conducted on frescos and wall paintings at the U.S. Capitol Building in order to determine the effectiveness of an electro-magnetic shaker-based approach of evaluating the condition of the substructure. A scanning laser Doppler vibrometer (LDV) was used to measure the vibratory response of the work of art subjected to the shaker excitation. This report contains a representative sample of the data obtained on two panels as well as a short synopsis of several observations and conclusions made regarding this data. Processed velocity data, in conjunction with data derived from traditional methodologies, indicate that the shaker-based LDV approach is an effective method for the efficient mapping of areas of structural deficiencies in need of amelioration by a conservation engineer.

DTIC

Lasers; Doppler Effect; Scanning; Vibration Meters

20040010858 Air Force Research Lab., Wright-Patterson AFB, OH

Ohio State University Cooperative Research and Development Agreement (CRDA) . Crystal Growth by Molecular Beam Epitaxy (MBE) and Characterization of Optoelectronic Devices

Siskaninetz, William J.; Oct. 2003; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-CRDE

Report No.(s): AD-A419311; AFRL-SN-WP-TM-2003-1196; No Copyright; Avail: CASI; [A03](#), Hardcopy

This is the final report for the Ohio State University CRDA, Project Number CRDE9501. The objective of this research project was two-fold: (1) develop improved knowledge regarding (but not limited to) Molecular Beam Epitaxy (MBE) Crystal Growth and Characterization for application to optoelectronic and other devices; (2) make available government facilities and expertise to help the OSU Research Foundation perform research and testing requested by industrial firms and other governmental organizations. The CRDA resulted in the development of spatial mode characterization techniques for semiconductor lasers. The CRDA provided an avenue to supply the OSU Research Foundation with in-house developed ridge waveguide semiconductor lasers and in return provided verification of in-house developed models used to design the laser devices as well as fabrication verification.

DTIC

Crystal Growth; Molecular Beam Epitaxy; Optoelectronic Devices; Research and Development; Characterization

20040012969 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications

Degnan, John J.; McGarry, Jan; Zagwodzki, Thomas; Donovan, Howard; Patterson, Don; Steggerda, Charles; Mallama, Anthony; Cheek, Jack; [2002]; 1 pp.; In English; 2003 Air Force Maui Optical Station Technical Conference, 8-13 Sep. 2003, Maui, HI, USA; Copyright; Avail: Other Sources; Abstract Only

NASA's new unmanned SLR2000 system is designed to track, with millimeter precision and using single photon returns, a constellation of roughly 24 retroreflector-equipped satellites, which range in altitude from about 300 km to 20,000 km. Totally autonomous operation and a common engineering configuration are expected to greatly reduce station operations costs relative to NASA's current manned systems. The system has also been designed with a goal of significantly lowering replication costs. All of the prototype components and subsystems have been completed and tested and have substantially met the original specifications. The prototype system is presently undergoing final integration and testing in a dedicated shelter with an azimuth tracking dome synchronized to the optical tracking mount. The facility also features a number of security features such as security cameras and sensors designed to detect power or thermal control problems or entry by unauthorized personnel. Field tests are in progress. The present paper provides an overview of the various subsystems and test results to date. The meteorological subsystem, which has operated successfully in the field for almost three years, consists of several sensors which measure: (1) pressure, temperature, and relative humidity; (2) wind speed and direction; (3) ground visibility and precipitation; and (4) local cloud cover as a function of station azimuth and elevation (day and night). A 'pseudo-operator' software program interprets the sensor readings and modifies satellite tracking priorities based on local meteorological conditions.

Derived from text

Photons; Satellite Laser Ranging; NASA Programs; General Overviews; Systems Engineering

37

MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20040008592 Lockheed Martin Corp., Bay Saint Louis, MS, USA

Engine Blowdown Device

Delcuze, Tim; Lossett, Ira; Pearson, Todd; Quinn, Jerry; Seals, James; Tarter, Danny; Wilkinson, Rodney; May 18, 2001; 4 pp.; In English

Report No.(s): SE-2001-05-00026-SSC; No Copyright; Avail: CASI; [A01](#), Hardcopy

Simple mechanisms have been devised to facilitate the blowdown of large diesel engines. These mechanisms reduce the amount of time and effort that must be expended before operating them.

Author

Diesel Engines; Leakage

20040010364 TIAX, LLC, Cambridge, MA, USA

Performance and Economics of Catalytic Glow Plugs and Shields in Direct Injection Natural Gas Engines for the Next Generation Natural Gas Vehicle Program

Mello, J. P.; Bezaire, D.; Sriramulu, S.; Weber, R.; Aug. 2003; In English

Report No.(s): DE2003-15004468; No Copyright; Avail: National Technical Information Service (NTIS)

Natural gas is an abundant domestic fuel. The U.S. Department of Energy (DOE) supports natural gas vehicle (NGV) research and development to help the USA reach its goal of reducing dependence on imported petroleum, as outlined in the Energy Policy Act of 1992. Another benefit of NGVs is that they can reduce emissions of regulated pollutants compared with diesel vehicles. This report details work to improve the ignition system in natural gas engines. The project was sponsored by DOE's Next Generation Natural Gas Vehicle (NGNGV) activity through the National Renewable Energy Laboratory.

NTIS

Contaminants; Economics; Natural Gas; Ignition Systems

20040010706 Earthquake Engineering Research Inst., Buffalo, NY, USA

Proceedings of the 2001 Earthquake Engineering Symposium for Young Researchers

Dargush, A.; Gould, P.; Pardoen, G.; Aug. 2002; In English, August 10 - 12, 2001, Salt Lake City, Utah

Report No.(s): PB2004-102470; MCEER-02-SP06; No Copyright; Avail: National Technical Information Service (NTIS)

This paper briefly discusses concepts of base isolation devices, and how they affect structures. In particular it shows the process and results from testing Low Damping Rubber Bearings and High Damping Rubber Bearings. It includes pictures and

tables of tests run, a diagram of the machine used, a code written to calculate the effective stiffness and Damping ratio of the bearings.

NTIS

Earthquakes; Bearings

20040010765 NASA Ames Research Center, Moffett Field, CA, USA

Temperature Swing Adsorption Compressor Development

Finn, John E.; Mulloth, Lila M.; Affleck, Dave L.; [2001]; 1 pp.; In English; Advanced Life Support PI Meeting, 7 Nov. 2001, Alexandria, VA, USA

Contract(s)/Grant(s): 131-20-10; No Copyright; Avail: Other Sources; Abstract Only

Closing the oxygen loop in an air revitalization system based on four-bed molecular sieve and Sabatier reactor technology requires a vacuum pump-compressor that can take the low-pressure CO₂ from the 4BMS and compress and store for use by a Sabatier reactor. NASA Ames Research Center proposed a solid-state temperature-swing adsorption (TSA) compressor that appears to meet performance requirements, be quiet and reliable, and consume less power than a comparable mechanical compressor/accumulator combination. Under this task, TSA compressor technology is being advanced through development of a complete prototype system. A liquid-cooled TSA compressor has been partially tested, and the rest of the system is being fabricated. An air-cooled TSA compressor is also being designed.

Author

Adsorption; Compressors; Fabrication; Air Purification; Temperature Dependence; Reactor Technology

20040012774 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Parameter Comparison for Low-Noise MoAu TES Bolometers

Benford, D. J.; Moseley, S. H.; Staguhn, J. G.; Allen, C. A.; Chervenak, J. A.; Stevenson, T. R.; Hsieh, W.; [2003]; 1 pp.; In English; Low Temperature Detector Workshop, 7-11 Jul. 2003, Genoa, Italy; No Copyright; Avail: Other Sources; Abstract Only

We describe a comparative investigation of the parameters of MoAu-bilayer Transition Edge Sensor (TES) bolometers designed for infrared detectors. A set of devices with variations in geometry were fabricated at the NASA/GSFC detector development facility. These detectors have different bilayer aspect ratios (providing differing normal state resistances and current densities), and have varieties of normal metal regions to study the effects of geometry on noise. These normal metal regions are oriented either parallel to or transverse to the direction of current flow, or both. The lowest noise detectors are found to have normal metal regions oriented transversely. For about a dozen different devices, we have measured a large set of parameters by means of a suite of tests. These include complex impedance measurements to derive time constants; IV curves to determine resistance and power; thermal conductance measurements; noise measurements as a function of device resistance; and rect resistance vs. temperature measurements.

Author

Low Noise; Molybdenum; Gold; Bolometers; Infrared Detectors; Fabrication

20040012794 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin

Tuttle, J. G.; Stevenson, T. R.; Canavan, E. R.; Dipirro, M. J.; Franz, D. E.; Shirron, P. J.; [2003]; 1 pp.; In English; Cryogenics Engineering Conference, Sep. 2003, Anchorage, AK, USA; No Copyright; Avail: Other Sources; Abstract Only

Magnetic thermometers are much less sensitive to self-heating due to rf noise than are traditional resistive thermometers. This makes them appealing at temperatures well below 0.1 Kelvin in the operating range of many space-flight detectors. We have developed and tested a magnetic thermometer which is deposited directly onto a substrate. This device, which uses the temperature dependence of iron-doped palladium's magnetic susceptibility, includes self-shielding deposited coils surrounding a sputtered palladium layer. It is read out using a SQUID to achieve high resolution. Its small size and perfect heat sinking should make it useful for the temperature control of space flight detector arrays, in particular those already using SQUID readouts. The design and test results for this device are discussed.

Author

Magnetic Permeability; Temperature Dependence; Thermometers; Magnetron Sputtering

STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20040008891 NASA Langley Research Center, Hampton, VA, USA

Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles

Scotti, Stephen J.; Clay, Christopher; Rezin, Marc; [2003]; 10 pp.; In English; AIAA/ICAS International Air and Space Symposium and Exposition, 14-17 Jul. 2003, Dayton, OH, USA

Contract(s)/Grant(s): RTA 23-721-21-51-01

Report No.(s): AIAA Paper 2003-2697; No Copyright; Avail: CASI; [A02](#), Hardcopy

This paper provides an overview of the evolution of structures and materials technology approaches to survive the challenging extreme environments encountered by earth-to-orbit space transportation systems, with emphasis on more recent developments in the USA. The evolution of technology requirements and experience in the various approaches to meeting these requirements has significantly influenced the technology approaches. While previous goals were primarily performance driven, more recently dramatic improvements in costs/operations and in safety have been paramount goals. Technologies that focus on the cost/operations and safety goals in the area of hot structures and thermal protection systems for reusable launch vehicles are presented. Assessments of the potential ability of the various technologies to satisfy the technology requirements, and their current technology readiness status are also presented.

Author

Reusable Launch Vehicles; Mechanical Properties; Space Transportation System; Technology Assessment; General Overviews; Structural Engineering; Refractory Materials

20040008892 NASA Glenn Research Center, Cleveland, OH, USA

Probabilistic Dynamic Buckling of Smart Composite Shells

Abumeri, Galib H.; Chamis, Christos C.; November 2003; 20 pp.; In English; 44th Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2003, Norfolk, VA, USA

Contract(s)/Grant(s): WBS 22-708-87-17

Report No.(s): NASA/TM-2003-212710; E-14220; No Copyright; Avail: CASI; [A03](#), Hardcopy

A computational simulation method is presented to evaluate the deterministic and nondeterministic dynamic buckling of smart composite shells. The combined use of composite mechanics, finite element computer codes, and probabilistic analysis enable the effective assessment of the dynamic buckling load of smart composite shells. A universal plot is generated to estimate the dynamic buckling load of composite shells at various load rates and probabilities. The shell structure is also evaluated with smart fibers embedded in the plies right below the outer plies. The results show that, on the average, the use of smart fibers improved the shell buckling resistance by about 10 percent at different probabilities and delayed the buckling occurrence time. The probabilistic sensitivities results indicate that uncertainties in the fiber volume ratio and ply thickness have major effects on the buckling load while uncertainties in the electric field strength and smart material volume fraction have moderate effects. For the specific shell considered in this evaluation, the use of smart composite material is not recommended because the shell buckling resistance can be improved by simply re-arranging the orientation of the outer plies, as shown in the dynamic buckling analysis results presented in this report.

Author

Composite Structures; Shells (Structural Forms); Smart Materials; Probability Theory; Buckling; Dynamic Loads; Computerized Simulation

20040010321 NASA Glenn Research Center, Cleveland, OH, USA

Structural Evaluation of Exo-Skeletal Engine Fan Blades

Kuguoglu, Latife; Abumeri, Galib; Chamis, Christos C.; November 2003; 18 pp.; In English; 44th Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2003, Norfolk, VA, USA

Contract(s)/Grant(s): WBS 22-708-48-11

Report No.(s): NASA/TM-2003-212711; E-14221; No Copyright; Avail: CASI; [A03](#), Hardcopy

The available computational simulation capability is used to demonstrate the structural viability of composite fan blades of innovative Exo-Skeletal Engine (ESE) developed at NASA Glenn Research Center for a subsonic mission. Full structural analysis and progressive damage evaluation of ESE composite fan blade is conducted through the NASA in-house

computational simulation software system EST/BEST. The results of structural assessment indicate that longitudinal stresses acting on the blade are in compression. At a design speed of 2000 rpm, pressure and suction surface outer most ply stresses in longitudinal, transverse and shear direction are much lower than the corresponding composite ply strengths. Damage is initiated at 4870 rpm and blade fracture takes place at rotor speed of 7735 rpm. Damage volume is 51 percent. The progressive damage, buckling, stress and strength results indicate that the design at hand is very sound because of the factor of safety, damage tolerance, and buckling load of 6811 rpm.

Author

Fan Blades; Structural Analysis; Engine Design; Computerized Simulation; Mechanical Properties

42

GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20040010587 Hawaii Univ., Honolulu, HI, USA

Rules for Identifying Ancient Life

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 4 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

J. William Schopf (University of California, Los Angeles) has spent many years examining ancient rocks on Earth to identify the oldest fossils. This work is painstaking and fraught with difficulty and potential errors. The worse mistake is to identify an ancient fossil, only to find out later that you were fooled by a nonbiologic mineral grain that looked like a fossil, but was not. This work has led to a set of criteria, or rules, that must be met for establishing credible evidence for past life in geologic samples.

Derived from text

Fossils; Identifying; Rocks

20040010708 Atmospheric and Environmental Research, Inc., San Ramon, CA

Performance Evaluation of CMAQ and PM-CAMx for the July 1999 SOS Episode

Zhang, Y.; Pun, B.; Wu, S. Y.; Vijayaraghavan, K.; Yelluru, G. K.; Oct. 2003; In English

Report No.(s): PB2004-102501; AER-CP131-03-02; No Copyright; Avail: National Technical Information Service (NTIS)

Several air quality models for particulate matter (PM) are being applied to the eastern USA (U.S.) for the 29 June-11 July 1999 episode of the Southern Oxidants Study (SOS). The Tennessee Valley Authority (TVA) is applying the Environmental Protection Agency (EPA) version of the Community Multiscale Air Quality model (CMAQ) with the Regional Acid Deposition Model, Version 2 (RADM2) gas-phase chemistry. CMAQ (EPA July 2002 version) and PM-CAMx (version 3.01) were applied to simulate the 29 June - 11 July 1999 episode of the Southern Oxidants Study. Both models used the Carbon-Bond Mechanism version IV for gas-phase chemistry. The modeling domain consists of two nested grids: the outer grid covers the contiguous USA (U.S.) with a 32 km horizontal resolution; the inner grid covers an area of the southeastern U.S. that includes Atlanta and Nashville with an 8 km horizontal resolution. Nineteen layers were used for both grids. The simulation results were evaluated with available data following a modeling protocol developed earlier.

NTIS

Air Quality; Atmospheric Chemistry; Particulates; Ozone

20040012957 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Reversing Flows and Heat Spike: Caused by Solar g-Modes?

Mayr, Hans G.; Wolff, Charles L.; September 2003; 15 pp.; In English; No Copyright; Avail: CASI; [A03](#), Hardcopy

The Quasi Biennial Oscillation in the Earth's upper atmosphere has an analog deep inside the Sun. As on Earth, the flow is east or west, it is at low latitude, and it reverses direction in a roughly periodic manner. The period in the solar case is 1.3 years. It was detected using solar oscillations similar to the way earthquakes are used to study the Earth's interior. But its cause was not known. We showed that global oscillations (g-modes) can supply enough angular momentum to drive zonal flows with the observed reversal period. This required a calculation of wave dissipation rates inside each flow and in the turbulent layer that separates any two flows of opposite sign. Heat that this process leaves behind causes a thermal spike inside the Sun at

the same depth. This may explain an anomaly in observed sound speed that has had no sure explanation.

Author

Earth Atmosphere; Upper Atmosphere; Quasi-Biennial Oscillation; Solar Oscillations; Acoustic Velocity

20040012989 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Moving NASA Remote Sensing Data to the GIS Environment for Health Studies

Vicente, Gilberto A.; Maynard, Nancy G.; [2003]; 1 pp.; In English; Pennsylvania Geographic Information Systems Conference: Data Access/Software Interoperability, 24-25 Jun. 2003, Harrisburg, PA, USA; Copyright; Avail: Other Sources; Abstract Only

There has been an increasing demand by the health community for improved data on many different environmental factors relevant to the links between the environment and disease occurrence and transmission. These data are important for GIS-based monitoring, risk mapping, and surveillance of epidemiological parameters on a large number of different spatial, temporal, and spectral resolutions. Accordingly, NASA is developing new approaches to data collection and distribution in order to improve access to multiple sources of data streams to increase spatial and temporal coverage. Methods are being developed to incorporate different, scalable capabilities to handle multiple data sources by adding, deleting and replacing components as required as well as associated tools for their management. An approach has been to search for innovative solutions focused on the creation, use and manipulation of data stored in many different archives. These include data transformation and combination as well as data and information tools that can assist the public health and science community to use existing and anticipated products in new and flexible ways. This presentation will provide an inventory of geophysical parameters derived from satellite remote sensing sensors that are useful for GIS-based public health studies. The presentation will also discuss the physical and scientific limitations of access to and use of these data for health applications such as resolution and format differences, lack of software interoperability, data access problems. Finally, there will be a summary of the recent steps the NASA program has taken to bring NASA-generated satellite products to a wider range of users in the GIS community.

Author

Public Health; Remote Sensing; NASA Programs; Data Acquisition; Geographic Information Systems

43

EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20040008894 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA

Radiometric Characterization of IKONOS Multispectral Imagery

Pagnutti, Mary; Ryan, Robert E.; Kelly, Michelle; Holekamp, Kara; Zanoni, Vicki; Thome, Kurtis; Schiller, Stephen; August 12, 2002; 49 pp.; In English

Contract(s)/Grant(s): NAS13-650

Report No.(s): SE-2002-08-00057-SSC; Copyright; Avail: CASI; [A03](#), Hardcopy

A radiometric characterization of Space Imaging's IKONOS 4-m multispectral imagery has been performed by a NASA funded team from the John C. Stennis Space Center (SSC), the University of Arizona Remote Sensing Group (UARS), and South Dakota State University (SDSU). Both intrinsic radiometry and the effects of Space Imaging processing on radiometry were investigated. Relative radiometry was examined with uniform Antarctic and Saharan sites. Absolute radiometric calibration was performed using reflectance-based vicarious calibration methods on several uniform sites imaged by IKONOS, coincident with ground-based surface and atmospheric measurements. Ground-based data and the IKONOS spectral response function served as input to radiative transfer codes to generate a Top-of-Atmosphere radiance estimate. Calibration coefficients derived from each vicarious calibration were combined to generate an IKONOS radiometric gain coefficient for each multispectral band assuming a linear response over the full dynamic range of the instrument. These calibration coefficients were made available to Space Imaging, which subsequently adopted them by updating its initial set of calibration coefficients. IKONOS imagery procured through the NASA Scientific Data Purchase program is processed with or without a Modulation Transfer Function Compensation kernel. The radiometric effects of this kernel on various scene types was also investigated.

All imagery characterized was procured through the NASA Scientific Data Purchase program.

Author

Radiometers; Characterization; Multispectral Band Scanners; Satellite Imagery

20040010539 Naval Research Lab., Bay Saint Louis, MS

About Nonlinear Dependence of Remote Sensing and Diffuse Reflection Coefficients on Gordon's Parameter

Haltrin, Vladimir I.; Gallegos, Sonia C.; Jan. 2003; 10 pp.; In English

Report No.(s): AD-A418885; NRL/PP/7330-03-0010; No Copyright; Avail: CASI; [A02](#), Hardcopy

Remote sensing i^{\wedge} and diffuse reflection R coefficients of seawater are dependent on inherent optical properties of seawater through the Gordon's parameter $bB / (a + bB)$, where a is an absorption and b is backscattering coefficients. $g = B$ Majority of researchers in ocean optics use linear approximation for i^{\wedge} and R , i. e. $i^{\wedge}g$ and $R \propto g$. This approach works well when $g \wedge 0.1$. All open and largest art of coastal waters satisfy this condition, but there are some cases when parameter g is as large as 0.98. We illustrate this fact with histogram of Gordon's parameter g for the Yellow sea waters. We present a choice of alternative rigorous nonlinear equations for R that solve this problem, i.e. significantly reduce the error of the restoration of the Gordon's parameter g from remote sensing optical data and estimate possible errors in using linear dependencies.

DTIC

Nonlinear Systems; Remote Sensors; Sea Water; Nonlinear Equations; Oceanography; Reflection

20040010589 Arizona Univ., Tucson, AZ, USA

Remote Sensing

Yingst, Aileen; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Remote sensing is a technique used for studying places or things when the measuring device must be far away from the scientist doing the measuring. That means it is a way to explore and study places you can't visit in person, at least, not yet. For example, the surface of Venus is invisible from Earth, because the planet is always covered in clouds. Even if we could see down to the surface scientists couldn't visit there because the temperature is over 800 F, hot enough to melt lead! So scientists have sent spacecraft to Venus to look under the cloud cover and onto the hot surface to do remote sensing. The pictures those spacecraft sent back have allowed them to understand more about what the surface looks like and how it formed. When we remotely sense a planet's surface, that often means that we take pictures of it, like the pictures you can take with a regular camera. You've probably seen some of these pictures, like those from the Moon, or taken by the Mars Pathfinder spacecraft. However, there are many other ways to study a planet. For example, we may want to know the surface roughness or the topography of a certain area (the changes in how high or low the land is compared to a standard elevation or 'sea level').

Author

Remote Sensing; Surface Roughness; Cloud Cover; Hot Surfaces

20040010648 Naval Research Lab., Bay Saint Louis, MS

Mapping Charting and Geodesy Branch. Abstracts of Publications 2000-2002

Harris, Michael M.; James, Dianne M.; Nov. 28, 2003; 208 pp.; In English

Report No.(s): AD-A418828; NRL/MR/7440--03-8717; No Copyright; Avail: CASI; [A10](#), Hardcopy

This document contains abstracts from publications written by the Naval Research Laboratory's Mapping, Charting, and Geodesy (MC&G) Branch during the period 1 January 2000 to 31 December 2002. During that time period, the MC&G branch published 11 chapters in books, 28 journal articles, and 26 NRL reports. The majority of the abstracts (83) are from conference proceedings. A video, 6 web pages, and 19 abstracts were also published. Abstracts from 5 patents awarded by the USA Patent and Trademark Office are also included. Indexes by author and type of publication are at the beginning of the report followed by a list of acronyms and the actual abstracts. The abstracts are listed in alphabetical order by first author. In cases where the first author was from another organization, they are sorted by first MC&G Branch author listed.

DTIC

Mapping; Geodesy; Hydrography

20040010762 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA, NASA Stennis Space Center, Bay Saint Louis, MS, USA

Use of IKONOS Data for Mapping Cultural Resources of Stennis Space Center, Mississippi

Spruce, Joseph P.; Giardino, Marco; February 26, 2002; 13 pp.; In English; 2002 NASA Environmental Management and Energy Conference, 12-14 Mar. 2002, Norfolk, VA, USA

Contract(s)/Grant(s): NAS13-650

Report No.(s): SE-2002-02-00011-SSC; No Copyright; Avail: CASI; [A03](#), Hardcopy

Cultural resource surveys are important for compliance with Federal and State law. Stennis Space Center (SSC) in Mississippi is researching, developing, and validating remote sensing and Geographical Information System (GIS) methods for aiding cultural resource assessments on the center's own land. The suitability of IKONOS satellite imagery for georeferencing scanned historic maps is examined in this viewgraph presentation. IKONOS data can be used to map historic buildings and farmland in Gainesville, MS, and plan archaeological surveys.

CASI

Satellite Imagery; Surveys; Cultural Resources; Thematic Mapping; Archaeology

44

ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power*; *20 Spacecraft Propulsion and Power*; and *28 Propellants and Fuels*.

20040010319 NASA Glenn Research Center, Cleveland, OH, USA

Fuel Cells for Space Science Applications

Burke, Kenneth A.; November 2003; 15 pp.; In English; First International Energy Conversion Engineering Conference, 17-21 Aug. 2003, Portsmouth, VA, USA

Contract(s)/Grant(s): WBS 22-755-12-03

Report No.(s): NASA/TM-2003-212730; E-14255; AIAA Paper 2003-5938; No Copyright; Avail: CASI; [A03](#), Hardcopy

Fuel cell technology has been receiving more attention recently as a possible alternative to the internal combustion engine for our automobile. Improvements in fuel cell designs as well as improvements in lightweight high-pressure gas storage tank technology make fuel cell technology worth a look to see if fuel cells can play a more expanded role in space missions. This study looks at the specific weight density and specific volume density of potential fuel cell systems as an alternative to primary and secondary batteries that have traditionally been used for space missions. This preliminary study indicates that fuel cell systems have the potential for energy densities of greater than 500 W-hr/kg, greater than 500W/kg and greater than 400 W-hr/liter, greater than 200 W/liter. This level of performance makes fuel cells attractive as high-power density, high-energy density sources for space science probes, planetary rovers and other payloads. The power requirements for these space missions are, in general, much lower than the power levels where fuel cells have been used in the past. Adaptation of fuel cells for space science missions will require down-sizing the fuel cell stack and making the fuel cell operate without significant amounts of ancillary equipment.

Author

Fuel Cells; Technology Utilization; Aerospace Sciences; Energy Technology; Space Missions

20040010476 National Renewable Energy Lab., Golden, CO

Thirteenth Workshop on Crystalline Silicon Solar Cell Materials and Processes. Extended Abstracts and Papers

Rand, J.; Saitoh, T.; Sinton, R.; Stavola, M.; Swanson, D.; Aug. 2003; In English

Report No.(s): DE2003-15004333; No Copyright; Avail: National Technical Information Service (NTIS)

The 13th Workshop will provide a forum for an informal exchange of technical and scientific information between international researchers in the photovoltaic and relevant non-photovoltaic fields. It will offer an excellent opportunity for researchers in private industry and at universities to prioritize mutual needs for future collaborative research. The workshop is intended to address the fundamental aspects of impurities and defects in silicon: their properties, the dynamics during device processing, and their application for developing low-cost processes for manufacturing high-efficiency silicon solar cells. A combination of oral, poster, and discussion sessions will review recent advances in crystal growth, new cell structures, new

processes and process characterization techniques, and cell fabrication approaches suitable for future manufacturing demands.
NTIS

Crystal Growth; Crystallinity; Solar Cells

20040010505 Department of Energy, Washington, DC

Supramolecular Structures for Photochemical Energy Conversion

Gust, D.; Moore, T. A.; Moore, A. L.; Jun. 14, 2003; 14 pp.

Report No.(s): DE2003-813606; No Copyright; Avail: Department of Energy Information Bridge

This final technical report covers results for the last three-year competitive renewal period of the above award. Technical details for earlier funding periods may be found in the previously-submitted Continuation Progress Reports for those periods. The overall goal of this research project was to mimic the energy transduction processes by which photosynthetic organisms harvest sunlight and convert it to forms of energy that are more easily used and stored. The results of such research may lead to new technologies for solar energy harvesting based on the natural photosynthetic process. They may also enrich our understanding and control of photosynthesis in living organisms, and lead to methods for enhancing natural biomass production, carbon dioxide removal, and oxygen generation. Progress has been made toward these goals in several complementary research areas. This is summarized briefly below, and reported in more detail in the publications listed in section F.

NTIS

Photosynthesis; Solar Energy

20040010508 Distributed Utility Associates, Livermore, CA, USA

Hybrid Nanorod-Polymer Solar Cell

Alivisatos, A. P.; Aug. 2003; 18 pp.; In English

Report No.(s): DE2003-15004565; NREL-SR-520-34567; No Copyright; Avail: Department of Energy Information Bridge

With the support of this grant, we successfully demonstrated that semiconductor nanorods can be used to fabricate readily processed and efficient hybrid solar cells together with polymers. By controlling nanorod length, we changed the distance over which electrons are transported directly through the thin-film device. Tuning the bandgap by altering the nanorod radius enabled us to optimize the overlap between the absorption spectrum of the cell and the solar emission spectrum. A photovoltaic device consisting of 7-nm by 60-nm CdSe nanorods and the conjugated polymer poly-3(hexylthiophene) was assembled from solution with an external quantum efficiency of over 54% and a monochromatic power conversion efficiency of 6.9% under 0.1 mW/cm² illumination at 515 nm. Under AM 1.5 Global solar conditions, we obtained a power conversion efficiency of 1.7%.

NTIS

Quantum Efficiency; Cadmium Selenides; Energy Conversion Efficiency; Solar Cells

20040010701 Swedish National Testing and Research Inst., Boras, Sweden

The Potential for solar Heat for Industrial Processes: A Preliminary Study of Swedish Possibilities

Kovacs, P.; Quicklund, H.; Pettersson, U.; 2003; 38 pp.; In Swedish

Report No.(s): PB2004-102146; SP-RAPP-2003:16; No Copyright; Avail: CASI; [A03](#), Hardcopy

This report starts with a short introduction to solar thermal energy applications in Sweden and the utilization of energy in general in the Swedish industry. The investigation is focusing on options for industrial solar heating applications. As waste heat recovery in many cases is competing with, or might be supplemented by solar heat, this field is also given some attention in the study. The conclusions are numerous, mainly within food- and mechanical industries, but that low prices on energy, unused potentials for heat recovery and low awareness about the possibilities for solar heat makes the situation tough today. Increasing prices on electricity and oil and decreasing costs for solar energy combined with a continuously growing awareness about environmental issues are key factors that speak for solar heating in a longer perspective.

NTIS

Solar Energy; Electricity; Industrial Plants

20040010805 NASA Marshall Space Flight Center, Huntsville, AL, USA

End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere

Coffey, Victoria; Chandler, Michael; Singh, Nagendra; Avannov, Levon; [2003]; 1 pp.; In English; Fall American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

We will show results from an end-to-end study of the energy transfer from injected magnetosheath plasmas to the near-Earth magnetospheric and ionospheric plasmas and the resulting ion outflow to the magnetosphere. This study includes modeling of the evolution of the magnetosheath precipitation in the cusp using a kinetic code with a realistic magnetic field configuration. These evolved, highly non-Maxwellian distributions are used as input to a 2D PIC code to analyze the resulting wave generation. The wave analysis is used in the kinetic code as input to the cold ionospheric ions to study the transfer of energy to these ions and their outflow to the magnetosphere. Observations from the Thermal Ion Dynamics Experiment (TIDE) and other instruments on the Polar Spacecraft will be compared to the modeling.

Author

Magnetic Field Configurations; Ions; Energy Transfer; Space Plasmas; Wave Generation; Magnetosheath

20040012896 Lawrence Livermore National Lab., Livermore, CA

Bromine Safety

Apr. 09, 2001; 114 pp.; In English

Report No.(s): DE2004-244419; UCRL-ID-144797; No Copyright; Avail: Department of Energy Information Bridge

The production and handling in 1999 of about 200 million kilograms of bromine plus substantial derivatives thereof by Great Lakes Chemical Corp. and Albemarle Corporation in their southern Arkansas refineries gave OSHA Occupational Injury/Illness Rates (OIIR) in the range of 0.74 to 1.60 reportable OIIRs per 200,000 man hours. OIIRs for similar industries and a wide selection of other U.S. industries range from 1.6 to 23.9 in the most recent OSHA report. Occupational fatalities for the two companies in 1999 were zero compared to a range in the U.S. of zero for all computer manufacturing to 0.0445 percent for all of agriculture, forestry and fishing in the most recent OSHA report. These results show that bromine and its compounds can be considered as safe chemicals as a result of the bromine safety standards and practices at the two companies. The use of hydrobromic acid as an electrical energy storage medium in reversible PEM fuel cells is discussed. A study in 1979 of 20 megawatt halogen working fluid power plants by Oronzio de Nora Group found such energy to cost 2 to 2.5 times the prevailing base rate at that time. New conditions may reduce this relative cost. The energy storage aspect allows energy delivery at maximum demand times where the energy commands premium rates. The study also found marginal cost and performance advantages for hydrobromic acid over hydrochloric acid working fluid. Separate studies in the late 70s by General Electric also showed marginal performance advantages for hydrobromic acid.

NTIS

Energy Storage; Manufacturing; Energy Conversion; Safety Factors

20040012933 Army Engineer Research and Development Center, IL, USA

Systems-Level Energy Audit for Main Complex, Construction Engineering Research Laboratory

Lin, Mike C.; Herron, Dale; Schwenk, David M.; Sohn, Chang W.; Westervelt, Eileen; Aug. 2003; 93 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419115; ERDC/CERL-TR-03-17; No Copyright; Avail: CASI; [A05](#), Hardcopy

As a result of the CERL sustainability workshop, a Phase I energy audit was conducted for CERL main complex (Buildings 1, 2, and 3) was conducted. The goals of the audit were to review energy and water use in the current main complex building, to review and inventory energy system equipment, and to devise short-and long-term energy improvement and water conservation strategies. Baseline references on utilities consumptions and costs were developed to help future periodic monitoring efforts. This report documents facility and energy systems information and energy management and water conservation opportunities identified in this study. A 40 percent reduction in building energy use is needed for CERL to meet the Army facility energy goal (by reducing the current Energy Use Index EUI of 160 KBtu/sq ft/yr to below 100 KBtu/sq ft/yr). Despite completion of several energy conservation projects at the CERL complex, it was found that the EUI has been increasing since 1998. Factors that likely contributed to this increase were summer air dehumidification (starting in FY00) and inadequate building insulation. Specific short- and long-term energy improvement strategies were recommended to address the site's water- and energy-conservation issues.

DTIC

Energy Consumption; Energy Conservation; Information Management

20040012937 Army Engineer Research and Development Center, IL, USA

Compressed Air System Survey at Sierra Army Depot, CA

Lin, Mike C.; Ganji, Ahmad R.; Liou, Shy-Sheng; Hackett, Bryan; Nov. 2000; 77 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-40162784AT45

Report No.(s): AD-A419142; ERDC/CERL-TR-00-37; No Copyright; Avail: CASI; [A05](#), Hardcopy

Compressed air (CA) is an indispensable commodity used in manufacturing and maintenance facilities. In most plants/shops, CA is centrally generated and distributed to users through a pipe network. Although a very convenient power source, CA systems are not cheap to operate. The annual cost of electricity needed to run an air compressor is near or more than the initial cost of the compressor. This study conducted complete CA system audits and surveys to reveal these opportunities at the Sierra Army Depot (SIAD). A CA system survey was conducted from 10 July 2000 through 13 July 2000. The site visit included an initial meeting with Depot personnel involved with the CA system operation, a tour of the CA facilities, an equipment inventory, inspection and tagging of air leaks, development of CA system drawing, system measurements, a review of data and manuals, interviews of personnel, and a summary meeting at the end of the visit. The audit team proposed specific measures that will yield substantial cost savings in the operation of the compressed air system. The team also recommended other energy conservation measures with good potential for substantial cost savings.

DTIC

Energy Consumption; Compressed Air

45

ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20040008645 Environmental Protection Agency, Chicago, IL, USA

Great Lakes Binational Toxics Strategy U.S. Challenge on Alkyl-lead: Report on Use of Alkyl-lead in Automotive Gasoline

Jun. 2000; 22 pp.

Report No.(s): PB2004-101892; No Copyright; Avail: CASI; [A03](#), Hardcopy

On April 7, 1997, the USA Environmental Protection Agency (USEPA) and Environment Canada (EC) signed The Canada-USA Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin (Binational Strategy) (1). This agreement provided a framework for reducing or eliminating persistent toxic substances, especially those that bioaccumulate, from the Great Lakes Basin. The Binational Strategy established quantifiable pollution reduction challenges for the time frame 1997 to 2006 involving twelve Level I substances: aldrin/dieldrin, chlordane, DDT, mirex, toxaphene, alkyl-lead, benzo(a)pyrene, dioxins and furans, hexachlorobenzene, mercury, PCBs, and octachlorostyrene. The Binational Strategy acknowledged and built on existing Canadian and U.S. regulatory programs that address the targeted substances, and the two governments will continue to cooperate on any new toxics reduction regulations. However, a cornerstone of the Binational Strategy is its reliance on voluntary measures to dramatically reduce pollutant discharges to the Great Lakes Basin. The Binational Strategy affirmed each country's commitment to virtually eliminating discharge of the targeted substances to the Great Lakes Basin and outlined a framework by which the countries can work together to achieve this objective.

NTIS

Toxicity; Lead (Metal); Gasoline; Contaminants; Regulations

20040008646 Eastern Research Group, Inc., Morrisville, NC

How to Prepare a Startup, Shutdown, Malfunction Plan for Collection and Control Systems at Municipal Solid Waste Landfills

Fanjoy, J.; Dec. 2003; 24 pp.; In English

Report No.(s): PB2004-101920; No Copyright; Avail: CASI; [A03](#), Hardcopy

This document explains how to prepare a startup, shutdown, malfunction plan for municipal solid waste landfills. Landfill owners and operators who are affected by the National Emission Standards for Hazardous Air Pollutants for Municipal Solid Waste Landfills (landfills NESHAP) and who must install a collection and control system must prepare a startup, shutdown, malfunction plan (SSM plan). For the landfills SSM plan, the primary concern is with malfunction of the landfill gas collection and controls system, not with the startup and shutdown of the entire source. Therefore, the guidance focuses primarily on the malfunction of the gas collection system, gas control system, and gas treatment system. The document describes what information the SSM plan should contain, to which operations the SSM plan applies, and explains how to keep records and reports. Also included is an appendix with example elements of an SSM plan for MSW landfills.

NTIS

Planning; Urban Planning; Landfills; Control Systems Design

20040008648 Eastern Research Group, Inc., Morrisville, NC

Example Moisture Mass Balance Calculations for Bioreactor Landfills

Alexander, A.; Dec. 2003; 42 pp.; In English

Report No.(s): PB2004-101922; No Copyright; Avail: CASI; [A03](#), Hardcopy

The purpose of this memorandum is to demonstrate example mass balance calculations that can be performed to estimate the moisture content of the waste mass in a bioreactor landfill. The Municipal Solid Waste Landfills NESHAP (40 CFR part 63, subpart AAAA) requires timely control of bioreactor landfills. As defined in the NESHAP, a bioreactor is a MSW landfill or a portion of a MSW landfill where any liquid, other than leachate or landfill gas condensate, is added in a controlled fashion to accelerate the anaerobic (without oxygen) biodegradation of the waste. The average moisture content of the waste in the area into which the liquid is added must be at least 40 percent (by weight) for the landfill or portion of the landfill to be considered a bioreactor. We have presented the example mass balance calculations based on the wet weight of waste. This is consistent with the approach detailed in the book, Landfill Bioreactor Design and Operation, by Debra Reinhart and Timothy Townsend and documented in the EPA Docket A-98-28 (Item IV-K-9).

NTIS

Bioreactors; Air Pollution; Moisture Content; Sanitation

20040008649 Environmental Protection Agency, Research Triangle Park, NC, USA

National Emission Standards for Hazardous Air Pollutants Surface Coating of Metal Cans. Background Information for Final Standards. Summary of Public Comments and Responses

Aug. 2003; 138 pp.; In English

Report No.(s): PB2004-101926; EPA-453/R-03-009; No Copyright; Avail: CASI; [A07](#), Hardcopy

On July 16, 1992 (57 FR 31576), the U.S. Environmental Protection Agency (EPA, or we) published a list of source categories slated for regulation under Section 112(c) of the Clean Air Act (CAA). This list included the source category surface coating of metal cans. We proposed standards for this source category on January 15, 2003 (68 FR 2110), pursuant to Section 112(d) of the CAA. The preamble for the proposed standards describes the rationale for the proposed standards. We solicited public comments at the time of proposal, and the public comment period lasted from January 15, 2003, to February 14, 2003. Industry representatives, regulatory agencies, environmental groups, and the general public were given the opportunity to comment on the proposed rule and to provide additional information during the public comment period. Although we offered at proposal the opportunity for oral presentation of data, views, or arguments concerning the proposed rule, no one requested a public hearing, and no public hearings were held on the proposed rule.

NTIS

Cans; Manufacturing; Emission; Air Pollution; Standards; Pollution Control

20040008661 Idaho Univ., Moscow, ID, USA

Parallel Hybrid-Electric Sport Utility Vehicle-FutureTruck 2003

Blackketter, D.; Albrecht, F.; Sep. 2003; In English

Report No.(s): PB2004-102063; NIATT-N03-06; No Copyright; Avail: National Technical Information Service (NTIS)

This final report details the development of the University of Idaho hybrid-electric, hybrid-hydraulic sport utility vehicle FutureTruck 2003 along with an overview of requirements, design features and results. The objectives of the University of Idaho FutureTruck project were to: Research and implement clean vehicle technologies that reduce the impact of transportation on the environment. Educate students and provide them with practical experience. Increase awareness and support of clean vehicle initiatives and progress.

NTIS

Transportation; Electric Hybrid Vehicles; Electric Motor Vehicles

20040010451 Swedish Defence Research Establishment, Stockholm

Reduction of the Noise and Gas Emissions Generated by the Activity of the Swedish Air Force Preliminary Studies

Tourde, D.; Hasselrot, A.; Feb. 2003; 40 pp.; In Swedish

Report No.(s): PB2004-101273; FOI-R-0697-SE; Copyright; Avail: National Technical Information Service (NTIS)

In this preliminary study, a general plan for the evaluation of the noise and gas emissions produced by military flights and the study of different means to reduce this annoyance is proposed by FOI's department of aviation environmental research. First the importance given to the reduction of the environmental impact of the Swedish defense material as well as the Swedish experience in solving environmental issues and its international recognition is presented. A special emphasis is given to the

mission given by the Swedish government to the Swedish Defense Material administration to reduce the environmental impact of military air traffic. The experience and the different tools at the disposition of FOI to compute aircraft noise and gas emission are then presented in details. A particular emphasis is given on the experience acquired by FOI with civil aviation and on the possibilities to put this knowledge at the disposal of the Swedish Defense Materials administration. Finally, a project proposal is presented. The goal of the project would be to reduce, in the long run, some of the environmental pollutions generated by the activities of the Swedish Air Force.

NTIS

Exhaust Emission; Exhaust Gases

20040010500 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Stanford Univ., Stanford, CA
Intercomparison of Numerical Simulation Codes for Geologic Disposal of CO₂

Pruess, K.; Garcia, J.; Kavscek, T.; Oldenburg, C.; Rutqvist, J.; Dec. 2002; In English

Report No.(s): DE2003-813566; LBNL-51813; No Copyright; Avail: National Technical Information Service (NTIS)

Numerical simulation codes were exercised on a suite of eight test problems that address CO₂ disposal into geologic storage reservoirs, including depleted oil and gas reservoirs, and brine aquifers. Processes investigated include single- and multi-phase flow, gas diffusion, partitioning of CO₂ into aqueous and oil phases, chemical interactions of CO₂ with aqueous fluids and rock minerals, and mechanical changes due to changes in fluid pressures. Representation of fluid properties was also examined. In most cases results obtained from different simulation codes were in satisfactory agreement, providing confidence in the ability of current numerical simulation approaches to handle the physical and chemical processes that would be induced by CO₂ disposal in geologic reservoirs. Some discrepancies were also identified and can be traced to differences in fluid property correlations, and space and time discretization.

NTIS

Carbon Dioxide; Rocks; Chemical Reactions

20040010696 Environmental Protection Agency, Research Triangle Park, NC

Application of the Models-3 Community Multi-Scale Air Quality (CMAQ) Model System to SOS/Nashville 1999

Pleim, J.; Binkowski, F.; Dennis, R.; Godowitch, J.; Otte, T.; 2003; 5 pp.

Report No.(s): PB2004-101311; EPA/600/A-03/049; No Copyright; Avail: CASI; A01, Hardcopy

The Models-3 Community Multi-scale Air Quality (CMAQ) model, first released by the USEPA in 1999 (Byun and Ching 1999), continues to be developed and evaluated. The principal components of the CMAQ system include a comprehensive emission processor known as the Sparse Matrix Operator Kernel for Emissions (SMOKE), a Chemical Transport Model (CTM), and a meteorology model, the Penn State/NCAR Mesoscale Model (MM5). Evaluation of the CMAQ modeling system includes simulation of a series of air quality field studies such as NARSTO and SOS. This paper describes many upgrades to the next release (June 2002) of the CMAQ system and our initial model application to the SOS/Nashville 1999 field experiment.

NTIS

Mathematical Models; Air Pollution

20040010713 Southwest Research Inst., San Antonio, TX, USA

Evaluation of Emission Characteristics Downstream of Diesel Oxidation Catalyst Technology

Shaw, K. A.; Jun. 2003; In English

Report No.(s): PB2004-102473; No Copyright; Avail: National Technical Information Service (NTIS)

Diesel oxidation catalysts are becoming ever more commonplace on today's diesel-powered passenger vehicles. They are also likely to be used in conjunction with other advanced emissions reduction technologies in the near future in order to meet EPA Tier 2 emission regulations. It is, then, important to have an accurate characterization of the gaseous and particulate exhaust conditions that will be generated with a diesel oxidation catalyst (DOC) upstream of advanced technologies. This program sought to offer this characterization for three DOCs of precious metal loadings of 20, 70, and 120 g/ft³. Each catalyst was first oven aged in an oxidizing atmosphere to mimic the activity of a moderately aged catalyst. The catalysts were then seasoned and stabilized on the test vehicle, a 1999 Mercedes Benz C220 CDI, prior to emissions testing. The emissions testing included total gaseous and particulate emissions, speciated gaseous emissions, particle number and sizing, and a host of particulate analyses that included metals, elemental and organic carbon, volatile organic fraction, and polynuclear-aromatic hydrocarbons.

NTIS

Diesel Engines; Catalysts; Oxidation

20040010770 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C.

Colarco, P. R.; Schoeberl, M. R.; Doddridge, B. G.; Marufu, L. T.; Torres, O.; Welton, E. J.; [2003]; 31 pp.; In English; Copyright; Avail: CASI; [A03](#), Hardcopy

Smoke and pollutants from Canadian forest fires were transported over the northeastern USA in July 2002. Lidar observations at the NASA Goddard Space Flight Center show the smoke from these fires arriving in an elevated plume that was subsequently mixed to the surface. Trajectory and three-dimensional model calculations confirm the origin of the smoke and show that it mixed to the surface after it was intercepted by the turbulent planetary boundary layer. Modeled smoke optical properties agreed well with aircraft and remote sensing observations provided coagulation of smoke particles was accounted for in the model. Our results have important implications for the long-range transport of pollutants and their subsequent entrainment to the surface, as well as the evolving optical properties of smoke from boreal forest fires.

Author

Entrainment; Optical Properties; Forest Fires; Pollution Transport; Planetary Boundary Layer

20040012617 Woods Hole Research Center, MA, USA

Biogeochemical Cycles in Degraded Lands

Davidson, Eric A.; Vieira, Ima Celia G.; ReisdeCarvalho, Claudio Jose; DeaneAbreuSa, Tatiana; deSouzaMoutinho, Paulo R.; Figueiredo, Ricardo O.; Stone, Thomas A.; [2004]; 12 pp.; In English

Contract(s)/Grant(s): NCC5-332; No Copyright; Avail: CASI; [A03](#), Hardcopy

The objectives of this project were to define and describe the types of landscapes that fall under the broad category of 'degraded lands' and to study biogeochemical cycles across this range of degradation found in secondary forests. We define degraded land as that which has lost part of its capacity of renovation of a productive ecosystem, either in the context of agroecosystems or as native communities of vegetation. This definition of degradation permits evaluation of biogeochemical constraints to future land uses.

Author

Biogeochemistry; Degradation; Terrain

20040012867 National Renewable Energy Lab., Golden, CO

Consumer Views on Transportation and Energy

Steiner, E.; Aug. 2003; 98 pp.; In English

Report No.(s): DE2003-15004470; NREL/TP-620-34468; No Copyright; Avail: Department of Energy Information Bridge

This document consists of six sections, including the introduction (Section 1). Section 2 examines public concern about U.S. dependence on imported oil, public assessment of the energy situation in the USA, and perceived effects of gasoline prices on individuals and households. In addition, this section focuses on public expectations and federal government actions that can be undertaken to deal with the energy situation and reduce dependence on imported oil. Section 3 examines public awareness of global-warming issues and perceived strategies of the USA and other lesser-developed countries to combat global warming. Section 4 Section 5 focuses on conventional and advanced-technology vehicles. In this report, advanced technology vehicles include hybrid-electric and diesel vehicles. The section examines the decisions vehicle owners make about their vehicles, as well as decisions about replacing vehicles. Section 5 also analyzes owners decisions about purchasing more fuel-efficient vehicles and advanced-technology vehicles. Section 6 looks at public attitudes toward travel, with an emphasis on the post-September 11, 2001, period. The publics perception of on-road travel and traffic congestion is also addressed in the final section.

NTIS

Transportation Energy; Fuel Consumption

20040012905 Texas Univ., Austin, TX, USA

Restricting the Use of Reverse Thrust as an Emissions Reduction Strategy (Revised)

Rice, C.; Walton, C. M.; Jul. 2003; In English

Report No.(s): PB2004-100249; REPT-16723-1; No Copyright; Avail: National Technical Information Service (NTIS)

As more metropolitan areas approach 'non-attainment' status for ozone, air pollution at airports is becoming an increasingly important topic. Most proposed emissions reduction strategies target passenger automobiles and airport ground service equipment (GSE). At many airports, the future growth in oxides of nitrogen (NOx) emissions from aircraft is likely

to offset any reduction achieved from GSE or passenger vehicles. In some metropolitan areas, airports may be responsible for as much as 10% of the regional NO_x. As a result, other alternatives are needed for emissions reduction at airports. Reverse thrust is commonly used along with wheel brakes to slow aircraft during landing and occasionally to 'power-back' aircraft away from a boarding gate. Currently, air pollution emissions generated during reverse thrust are not included in airport emissions inventories. Since the majority of aircraft NO_x emissions occur off-airport during climbout and approach, reverse thrust can be responsible for an additional 15% or more of the on-airport NO_x. This can create significant air quality impacts in the vicinity of the busiest airports. This research will attempt to quantify and model the air quality effect of NO_x emissions produced during reverse thrust, using Dallas/Ft. Worth International Airport as a case study.

NTIS

Airports; Thrust Reversal; Air Pollution; Exhaust Emission

46

GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20040008637 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA

An Analysis of Gravity-Field Estimation Based on Intersatellite Dual-1-Way Biased Ranging

Thomas, J. B.; May 1999; 196 pp.; In English

Report No.(s): AD-A410563; JPL-98-15; No Copyright; Avail: CASI; [A09](#), Hardcopy

The GRACE (Gravity Recovery And Climate Experiment) mission is designed to make global, highly accurate measurements of the Earth's gravity field with high spatial resolution. Ancillary GPS occultation measurements are also to be carried out for atmospheric monitoring. In the dual-1-way biased ranging of this mission, the range between two satellites separated by 100 to 200 km in nearly polar, coplanar, circular orbits, is measured to very high precision, to within an additive constant, through the exchange of K- and Ka-band sinusoidal signals. Such biased ranging data, along with GPS L-band range and phase data, can be processed and fit over successive multiday intervals to obtain accurate estimates of the Earth's gravity field. This report approximately models and analyzes this process, from the generation of the RF signals at the two satellites through the extraction of the geopotential. The steps include generation of the transmitted signals, processing the received signals to extract high-rate baseband phase, carrying out a dual-1-way combination of baseband phase to extract high-rate biased range for each band, combining K- and Ka-band ranges to correct for the ionosphere effect, and processing the resulting high-rate biased range values to extract three types of reduced-rate observables: biased range, range rate and range acceleration. The version of dual-1-way biased ranging developed by this report improves upon previous versions in a number of ways: highly accurate satellite-timetag corrections derived from concurrent GPS data, better baseband phase extraction using highly digital processing, highly accurate USO-rate calibration derived from concurrent GPS data, an improved method for extracting high-rate biased range from baseband phase, improved filtering for extracting reduced- rate observables from high-rate biased range, and parallel extraction of three observable types.

DTIC

Gravitational Fields; Global Positioning System; Earth Gravitation

20040010608 Texas Univ., Austin, TX, USA

GRACE: Gravity Recovery and Climate Experiment

Space Science Reference Guide, 2nd Edition; [2003]; 5 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

While gravity is much weaker than other basic forces in nature, such as magnetism and electricity, its effects are ubiquitous and dramatic. Gravity controls everything from the motion of the ocean tides to the expansion of the entire Universe. To learn more about the mysteries of gravity, twin satellites named GRACE - short for Gravity Recovery and Climate Experiment - launched in March 2002 to make detailed measurements of Earth's gravity field. This experiment could lead to discoveries about gravity and Earth's natural systems, which could have substantial benefits for society and the world's population. The GRACE mission is the inaugural flight of NASA's Earth System Science Pathfinder Program (ESSP). A component of NASA's Earth Science Enterprise (ESE), the ESSP missions are intended to address unique, specific, highly

focused scientific issues and provide measurements required to support Earth science research.

Derived from text

Earth Gravitation; Geodesy; Scientific Satellites; Gravitational Fields

20040010767 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Orbit Design for Phase I and II of the Magnetospheric Multiscale Mission (MMS)

Hughes, Steve P.; [2003]; 1 pp.; In English; 2004 AAS/AIAA Space Flight Mechanics Meeting, 8-12 Feb. 2004, Maui, HI, USA; No Copyright; Avail: Other Sources; Abstract Only

The Magnetospheric Multiscale Mission (MMS) is a NASA mission intended to make fundamental advancements in our understanding of the Earth's Magnetosphere. There are three processes that MMS is intended to study including magnetic reconnection, charged particle acceleration, and turbulence. There are four phases of the MMS mission and each phase is designed to study a particular region of the Earth's magnetosphere. The mission is composed of a formation of four spacecraft that are nominally in a regular tetrahedron formation. In this work, we present optimal orbit designs for Phase I and II. This entails designing optimal reference orbits so that the spacecraft dwell-time in the region of interest is a maximum. This is non-trivial because the Earth's magnetosphere is dynamic and its shape and position are not constant in inertial space. Optimal orbit design for MMS also entails designing the formation so that the relative motion of the four spacecraft yields the greatest science return. We develop performance metrics that are related to the science return, and use Sequential Quadratic Programming (SQP) to determine optimal relative motion solutions. We also ensure that practical constraints such as maximum eclipse time and minimum inter-spacecraft separation distances are not violated.

Author

Earth Magnetosphere; NASA Space Programs; Optimal Control; Spacecraft Orbits

20040010772 Air Force Technical Applications Center, Patrick AFB, FL

A Plan of Development for Detection Systems for Seismic and Infrasound Arrays

Blandford, Robert R.; Apr. 8, 2002; 62 pp.; In English

Report No.(s): AD-A418865; AFTAC-TR-02-007; No Copyright; Avail: CASI; [A04](#), Hardcopy

A review is given of standard array design and signal processing for teleseismic and regional seismic arrays. The review is extended to F and correlation detection for seismic and infrasound arrays, to array design for infrasound arrays, and to optimal detection on single channels. With this background, a plan of development is suggested which will bring seismic and infrasound array detection processing fully up-to-date with the procedures recommended by the latest research. Suggestions are also made as to the proper design of new infrasound arrays.

DTIC

Arrays; Infrasonic Frequencies; Seismic Waves

20040010822 Ohio State Univ., Columbus, OH

Validation of the Parameterized Real-Time Ionospheric Specification Model (PRISM)

Pulliam, Robert C.; Jan. 2003; 101 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418923; CI02-230; No Copyright; Avail: CASI; [A06](#), Hardcopy

The earth's ionosphere between 60km and 1000km altitude contains a significant amount of partially ionized plasma that affects the propagation of radio waves. This plasma is created when extreme ultraviolet (EUV) light from the sun strips electrons from the neutral molecules in the Earth's atmosphere. The ionosphere's free electron density is highly variable and often unstable and can adversely affect Department of Defence systems which rely on radio wave propagation. These effects include: inaccurate position readings from GPS satellites, communication disturbances, and communication outages. The Air Force Research Laboratory has developed a Parameterized Real-time Ionospheric Specification Model (PRISM) that specifies the density of free electrons in the ionosphere on a global scale. This research will focus on validating PRISM using data from GPS satellites, the Digital Portable Sounding (DPS) network, and TOPEX/Poseidon data. In order to do a complete performance analysis, several time periods (3-6 weeks) of varying solar activity will be selected. Once these periods are selected PRISM will be initialized two different ways. The first initialization will be made without any real time input data and the output will be purely PRISM climatology. As for the second initialization PRISM will be given the real time data that the Air Force Weather Agency uses.

DTIC

Real Time Operation; Earth Atmosphere; Ionospherics; Models; Proving

20040012601 NASA Marshall Space Flight Center, Huntsville, AL, USA

Stormtime Particle Energization with AMIE Potentials

Khazanov, George V.; Liemohn, Michael W.; Newman, Timothy S.; Fok, Mei-Ching; Ridley, Aaron J.; [2003]; 2 pp.; In English; 2003 Fall American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Simulations were conducted to investigate the influence of rapid electric field fluctuations on electron energization in the inner magnetosphere based on the assimilative mapping of ionospheric electrodynamics (AMIE) technique. Simulations for four different magnetic storms were run, namely those that occurred on May 15, 1997, May 4, 1998, September 25, 1998, and October 19, 1998. Here, we have examined the formation of high energy electrons in the inner magnetosphere during these storm events with our recently-developed relativistic radiation belt transport code. The point of this numerical experiment is to show that a simulation of a real event must have the high time resolution electric field input files in order to produce the seed population for the radiation belts, which are often observed to increase in the days following a magnetic storm. Specifically, a cadence of the global electric field pattern of 5 minutes or less produces inner magnetospheric fluxes that are larger (by up to 5 orders of magnitude) than fluxes produced with a longer cadence. Differences were particularly large relative to simulation results with a 3-hour time cadence, analogous to a Kp-driven electric field model.

Author

Electrodynamics; Electric Fields; Magnetic Storms; Computerized Simulation; Ionospheres

20040012776 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results

Spinhrne, J. D.; Palm, S. P.; Hlavka, D. L.; Hart, W. D.; Mahesh, A.; Welton, E. J.; [2003]; 1 pp.; In English; IGARSS 2003, 21-25 Jul. 2003, Toulouse, France; No Copyright; Avail: Other Sources; Abstract Only

The Geoscience Laser Altimeter System launched in early 2003 is the first satellite instrument in space to globally observe the distribution of clouds and aerosol through laser remote sensing. The instrument is a basic backscatter lidar that operates at two wavelengths, 532 and 1064 nm. The mission data products for atmospheric observations include the calibrated, observed, attenuated backscatter cross section for cloud and aerosol; height detection for multiple cloud layers; planetary boundary layer height; cirrus and aerosol optical depth and the height distribution of aerosol and cloud scattering cross section profiles. The data is expected to significantly enhance knowledge in several areas of atmospheric science, in particular the distribution, transport and influence of atmospheric aerosol. Measurements of the coverage and height of polar and cirrus cloud should be significantly more accurate than previous global measurement. Initial result from the first several months of operation will be presented.

Author

Geophysics; Laser Altimeters; Satellite Instruments; Cloud Physics; Atmospheric Chemistry

20040012777 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space

Welton, Ellsworth; Spinhrne, James D.; Palm, Steven P.; Hlavka, Dennis; Hart, William; [2003]; 2 pp.; In English; 2nd International Workshop on Mineral Dust, 10-12 Sep. 2003, Paris, France; No Copyright; Avail: CASI; A01, Hardcopy

On January 12, 2003 NASA launched the first satellite-based lidar, the Geoscience Laser -Altimeter System (GLAS), onboard the ICESat spacecraft. The GLAS atmospheric measurements introduce a fundamentally new and important tool for understanding the atmosphere and climate. In the past, aerosols have only been studied from space using images gathered by passive sensors. Analysis of this passive data has lead to an improved understanding of aerosol properties, spatial distribution, and their effect on the earth's climate. However, these images do not show the aerosol's vertical distribution. As a result, a key piece of information has been missing. The measurements now obtained by GLAS will provide information on the vertical distribution of aerosols and clouds, and improve our ability to study their transport processes and aerosol-cloud interactions. Here we show an overview of GLAS, provide an update of its current status, and present initial observations of dust profiles. In particular, a strategy of characterizing the height profile of dust plumes over source regions will be presented.

Author

Aerosols; Geophysics; Laser Altimeters; Vertical Distribution; Satellite Observation; NASA Space Programs; Dust

20040012780 Communications Research Lab., Japan

Review of the Communications Research Laboratory, Volume 48, No. 3

September 2002; ISSN 0914-9279; 158 pp.; In Japanese; See also 20040012781 - 20040012791; Copyright; Avail: Other Sources

The following reports are presented from the Review of the Communications Research Laboratory: Solar and Solar Wind: Energy Build-up Study of Solar Flares; Solar and Solar Wind: High Energy Particle Acceleration in the Heliosphere; Solar and Solar Wind: Solar Wind and Interplanetary Disturbances; Solar and Solar Wind: Interplanetary Magnetic Flux Ropes; Magnetosphere: Formation of the Magnetosphere and Magnetospheric Plasma Regime; Magnetosphere: Generation of Convection in the Magnetosphere-ionosphere Coupling System; Magnetosphere: Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field; Magnetosphere: Transmission Line Model for the Ground Magnetic Disturbances; Magnetosphere: Geomagnetic Storms; Magnetosphere: Space Weather Research with Computer Simulations; and Ionosphere and Thermosphere: Ionospheric Irregularities.

CASI

Magnetosphere-Ionosphere Coupling; Solar Flares; Solar Wind; Earth Magnetosphere

20040012783 Communications Research Lab., Japan

Magnetosphere: Space Weather Research with Computer Simulations

Shimazu, Hironori; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 137-142; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

Computer simulations in space weather researches are reviewed. We introduce two different points of view and methods of the computer simulation, which are characteristic of the space weather simulations: One is the view from global macro-structure and the other is the one from fundamental micro-structure.

Author

Computerized Simulation; Space Weather; Earth Magnetosphere

20040012784 Communications Research Lab., Japan

Solar and Solar Wind: Interplanetary Magnetic Flux Ropes

Marubashi, Katsuhide; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 37-53; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

The purpose of this review is to examine the possibility of predicting large geomagnetic storms from solar observations. We focus on three topics: the relationship between coronal magnetic fields and interplanetary magnetic flux ropes; the role of magnetic flux ropes in geomagnetic storms, and further studies needed for improving our ability to predict geomagnetic storms based on our knowledge of interplanetary magnetic flux ropes.

Author

Interplanetary Magnetic Fields; Predictions; Coronal Mass Ejection; Geomagnetism

20040012785 Communications Research Lab., Japan

Magnetosphere: Formation of the Magnetosphere and Magnetospheric Plasma Regime

Obara, Takahiro; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 55-67; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

The Earth's magnetosphere is formed by the plasma flow from the Sun or solar wind. The solar wind particle can enter the magnetosphere through non-MHD processes and produces specific regions of plasma. We describe the fundamental physics of the magnetosphere.

Author (revised)

Earth Magnetosphere; Solar Wind

20040012786 Communications Research Lab., Japan

Ionosphere and Thermosphere: Ionospheric Irregularities

Maruyama, Takashi; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 143-156; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

Ionospheric irregularities cause scintillations of trans-ionospheric radio waves from satellites. Most severe cases are the scintillations due to plasma bubbles at low latitudes near the magnetic equator, which results in fluctuations of L-band radio signals by 20 dB or more. For the prediction of onsets of plasma bubbles, investigation of a physical mechanism is indispensable. Also precursory phenomena of bubble onsets will be valid for the prediction. This article describes outstanding problems for the prediction of severe ionospheric scintillations and an ongoing observational approach in CRL.

Author

Ionospheric Disturbances; Thermosphere; Radio Waves; Plasma Bubbles

20040012787 Communications Research Lab., Japan

Magnetosphere: Generation of Convection in the Magnetosphere-ionosphere Coupling System

Tanaka, Takashi; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 69-92; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

Based on the magnetosphere-ionosphere (M-I) coupling scheme, convection as a complex system is considered including the generation of plasma population regimes in the magnetosphere. To guarantee the self-consistency, the MHD simulation is adopted to analyze the problem. In these considerations, primary elements that must be set to a self-consistent configuration are convection flow in the magnetosphere and ionosphere, field aligned current (FAC) systems, ionospheric currents, energy conversion processes, and plasma pressure. Then, global current systems coupled with plasma population regimes are derived from the MHD force balance controlling the convection.

Author

Magnetosphere-Ionosphere Coupling; Convection

20040012788 Communications Research Lab., Japan

Magnetosphere: Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field

Hashimoto, K. Kumiko; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 93-104; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

In order to discuss a role of the ionosphere in the magnetosphere-ionosphere coupling system we review the models of plasma convection development on the basis of the ground observations and the physical ionospheric model in the 3D global MHD simulation.

Author (revised)

Magnetosphere-Ionosphere Coupling; Earth Ionosphere

20040012790 Communications Research Lab., Japan

Magnetosphere: Transmission Line Model for the Ground Magnetic Disturbances

Kikuchi, Takashi; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 105-121; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

Many observations have indicated that the magnetosphere convection electric field is transmitted to the low latitude ionosphere and to the inner magnetosphere within several minutes, and cause prompt development of ground magnetic disturbances and of the plasma convection in the global ionosphere and in the inner magnetosphere. One of the purposes of this paper is to review the global features of the ground magnetic disturbances and the 3-dimensional current models explaining the observations. The other purpose is to propose the magnetosphere-ionosphere transmission line model that explains the transmission of the Poynting flux from the outer magnetosphere to the low latitude ionosphere and to the inner magnetosphere.

Author

Magnetic Disturbances; Transmission Lines; Electric Fields; Earth Magnetosphere

20040012791 Communications Research Lab., Japan

Magnetosphere: Geomagnetic Storms

Nagatsuma, Tsutomu; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 123-136; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

Geomagnetic storms are one of the largest disturbances in the magnetosphere. This phenomenon is characterized by the global depression of geomagnetic field whose magnitude is less than several tens or hundreds of nT on the ground. The coupling among the solar wind, the magnetosphere and the ionosphere causes this phenomenon. Geomagnetic storms develop when the solar wind-magnetosphere coupling is enhanced by the solar wind disturbances (e.g. Coronal hole and CMEs) with strong magnetic field. The results of the geomagnetic storm data are presented.

Author

Magnetic Storms; Earth Magnetosphere; Magnetic Disturbances; Geophysics

20040012799 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Goddard Cumulus Ensemble (GCE) Model: Application for Understanding Precipitation Processes

Tao, Wei-Kuo; [2002]; 1 pp.; In English; 83rd AMS Meeting-Simpson Symposium, 9-13 Feb. 2003, Long Beach, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

One of the most promising methods to test the representation of cloud processes used in climate models is to use observations together with Cloud Resolving Models (CRMs). The CRMs use more sophisticated and realistic representations of cloud microphysical processes, and they can reasonably well resolve the time evolution, structure, and life cycles of clouds and cloud systems (size about 2-200 km). The CRMs also allow explicit interaction between out-going longwave (cooling) and incoming solar (heating) radiation with clouds. Observations can provide the initial conditions and validation for CRM results. The Goddard Cumulus Ensemble (GCE) Model, a cloud-resolving model, has been developed and improved at NASA/Goddard Space Flight Center over the past two decades. Dr. Joanne Simpson played a central role in GCE modeling developments and applications. She was the lead author or co-author on more than forty GCE modeling papers. In this paper, a brief discussion and review of the application of the GCE model to (1) cloud interactions and mergers, (2) convective and stratiform interaction, (3) mechanisms of cloud-radiation interaction, (4) latent heating profiles and TRMM, and (5) responses of cloud systems to large-scale processes are provided. Comparisons between the GCE model's results, other cloud-resolving model results and observations are also examined.

Author

Climate Models; Cloud Physics; Precipitation (Meteorology); Clouds (Meteorology)

20040012823 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Factors Affecting the Latitudinal Location of the Intertropical Convergence Zone in a GCM

Chao, Winston C.; Chen, Baode; [2002]; 1 pp.; In English; American Meteorological Society 83rd Annual Meeting, 9-13 Feb. 2003, Long Beach, CA, USA; Copyright; Avail: Other Sources; Abstract Only

The dominant role of the latitudinal peak of the sea surface temperature (SST) in determining the latitudinal location of the intertropical convergence zone (ITCZ) is well-known. However, the roles of the other factors are less well-known and are the topic of this study. These other factors include the inertial stability, the interaction between convection and surface fluxes and the interaction between convection and radiation. Since these interactions involve convection, in a model they involve the cumulus parameterization scheme. These factors are studied with a general circulation model with uniform SST and solar angle. Under the aforementioned model settings, the latitudinal location of the ITCZ is the latitude where the balance of two types of attraction on the ITCZ, both due to earth's rotation, exists. Directly related to the Coriolis parameter, the first type pulls the ITCZ toward the equator and is not sensitive to model design changes. Related to the convective circulation, the second type pulls the ITCZ poleward and is sensitive to model design changes. Due to the shape and the magnitude of the attractors, the balance of the two types of attractions is reached either at the equator or more than 10 degrees away from the equator. The former case results in a single ITCZ over the equator and the latter case a double ITCZ straddling the equator.

Author

Atmospheric General Circulation Models; Geomagnetic Latitude; Intertropical Convergent Zones; Position (Location)

20040012857 NASA Marshall Space Flight Center, Huntsville, AL, USA

Conjugate Auroral Imagery

Spann, Jim; [2003]; 1 pp.; In English; Fall American Geophysical Union Meeting, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Conjugate studies of high-latitude geomagnetic activity are central to understanding the (truly) global magnetospheric response to external perturbations, i.e. the solar wind, and the role of the ionosphere in modulating and coupling with the magnetosphere. Interhemispheric asymmetries as manifested in auroral emissions have been observed for over 40 years. Unfortunately, the nature of the problem has limited the type and extent of studies that can be performed to either conjugate ground based observations or comparison of space based images with all-sky cameras. Recently Frank and Sigwarth (2002) published results using unique simultaneous images from Polar of the northern and southern aurora, but these are necessarily limited to the nighttime and at oblique angles. However, conjunctive images made with the cameras from the Polar and IMAGE missions contain simultaneous conjugate images of the large-scale aurora under many and varying conditions. This rich data set provides an opportunity to study interhemispheric auroral asymmetries and investigate their occurrence as a function of solar wind conditions and ionospheric parameters such as conductivity. In order to use images of different scenes from each of these cameras, knowledge of their relative response is required. To that end, this paper will present preliminary results of comparing the images with emphasis on data from the Polar UVI LBH filters and the IMAGE FUV WIC.

Author

Auroras; Imagery; Conjugates; Solar Wind; Asymmetry; Wind Velocity

20040012979 NASA Goddard Space Flight Center, Greenbelt, MD, USA

PAIRS, The GIS-Based Incident Response System for Pennsylvania, and NASA

Conrad, Eric; Arbegast, Daniel; Maynard, Nancy; Vicente, Gilberto; [2003]; 1 pp.; In English; Pennsylvania Geographic

Information Systems Conference: Environmental and Public Health, 24-25 Jun. 2003, Harrisburg, PA, USA; No Copyright; Avail: Other Sources; Abstract Only

Over the past several years the Pennsylvania Departments of Environmental Protection (DEP), Health (DOH), and Agriculture (PDA) built the GIS-based Pennsylvania West Nile Surveillance System. That system has become a model for collecting data that has a field component, laboratory component, reporting and mapping component, and a public information component. Given the success of the West Nile Virus System and the events of September 11, 2001, DEP then embarked on the development of the Pennsylvania Incident Response System, or PAIRS. PAIRS is an effective GIS-based approach to providing a system for response to incidents of any kind, including terrorism because it is building upon the existing experience, infrastructure and databases that were successfully developed to respond to the West Nile Virus by DEP, DOH, and PDA. The proposed system can be described as one that supports data acquisition, laboratory forensics, decision making/response, and communications. Decision makers will have tools to view and analyze data from various sources and, at the same time, to communicate with the large numbers of people responding to the same incident. Recent collaborations with NASA partners are creating mechanisms for the PAIRS system to incorporate space-based and other remote sensing geophysical parameters relevant to public health assessment and management, such as surface temperatures, precipitation, land cover/land use change, and humidity. This presentation will describe the PAIRS system and outline the Pennsylvania-NASA collaboration for integration of space-based data into the PAIRS system.

Author

Geographic Information Systems; NASA Programs; Environment Protection; Geophysics; Pennsylvania; Remote Sensing

20040012981 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Possible Stick-Slip Mechanism for Whillans Ice Stream

Bindschadler, Robert; King, Matt; Vornberger, Patricia; [2003]; 1 pp.; In English; IGS Symposium on Fast Glacier Flow, 29 May 2003, WA, USA; Copyright; Avail: Other Sources; Abstract Only

Tidally-induced stick-slip motion in the mouth of Whillans Ice Stream provides a unique natural experiment in ice-stream response behavior and from which we might learn a great deal about subglacial till properties and sub-ice-stream conditions. At the IGS Symposium on Fast Glacier Flow (Yakutat, 2002), we reported our observations of stick-slip motion and demonstrated its synchronicity with tidal forcing. Recently, we have completed additional processing of our GPS data in differential mode. It reveals more details of the stick-slip events and illustrates that within 30 seconds, the temporal interval of our data, the ice stream accelerates to a speed corresponding to a completely lubricated bed. While details of individual events vary, there seems to be strong evidence of an elastic rebound on the time scale of one hour following most events. This suggests the event involves the release of stored elastic strain energy in the ice. The similar displacements of events suggest further that till or subglacial hydrologic properties limit the amount of elastic strain released in any single event. We follow a line of reasoning that dilatant strengthening limits the slip displacement and present model of the stick-slip process. To match the observed delay between the peak ocean tide and stick-slip events, our model includes a propagating pressure wave in the subglacial hydrologic system between the grounding line, where the rising tide first increases the subglacial water pressure and regions upstream where stored elastic strain increases the basal shear stress. This high-tide event is released when the increased water pressure reaches the region of increased shear stress. Dilatant strengthening stops the event by increasing pore volume and lowering the water pressure. Following this event, falling tide increases the normal forces, compresses the till and increases pore pressure again, leading to the second falling-tide event we observe every tidal cycle.

Author

Ice; Streams; Glaciology; Earth Tides

20040012999 Communications Research Lab., Tokyo, Japan

Transmission Line Model for Ground Magnetic Disturbances

Kikuchi, Takashi; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 119-138; In English; See also 20040012998; Copyright; Avail: Other Sources

Many observations have indicated that the magnetospheric convection electric field is transmitted to the low latitude ionosphere and to the inner magnetosphere within several minutes, and cause prompt development of ground magnetic disturbances and of the plasma convection in the global ionosphere and in the inner magnetosphere. One of the purposes of this paper is to review the global features of the ground magnetic disturbances and the 3-dimensional current models explaining the observations. The other purpose is to propose the magnetosphere-ionosphere transmission line model that

explains the transmission of the Poynting flux from the outer magnetosphere to the low latitude ionosphere and to the inner magnetosphere.

Author

Geomagnetism; Magnetic Disturbances; Earth Surface; Three Dimensional Models

20040013003 Kyushu Univ., Japan

Generation of Convection in the Magnetosphere-Ionosphere Coupling System

Tanaka, Takashi; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 75-101; In English; See also 20040012998; Copyright; Avail: Other Sources

Based on the magnetosphere-ionosphere (M-I) coupling scheme, convection as a complex (compound) system is considered including the generation of plasma population regimes in the magnetosphere. To guarantee the self-consistency, the MHD simulation is adopted to analyze the problem. In these considerations, primary elements that must be set to a self-consistent configuration are convection flows in the magnetosphere and the ionosphere, field aligned current (FAC) systems, ionospheric currents, energy conversion processes, and plasma pressure. Then, global current systems coupled with plasma population regimes are derived from the magnetohydrodynamic (MHD) force balance controlling the convection. The magnetospheric model derived from this consideration is the closed magnetosphere with open cusp. Based on the convection model proposed in this paper, a suggestion is given for the substorm models in the next decade that they must develop from a modular model to a globally self-consistent model.

Author

Magnetosphere-Ionosphere Coupling; Convection; Plasmas (Physics); Magnetohydrodynamics

20040013008 Communications Research Lab., Japan

Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field

Hashimoto, K. Kumiko; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 103-117; In English; See also 20040012998; Copyright; Avail: Other Sources

It has been clarified that the night-side ionospheric convection immediately develops due to changes in direction of the solar wind magnetic field. The observational facts are inconsistent with the traditional model of the plasma convection in the magnetosphere-ionosphere coupling system. In order to discuss a role of the ionosphere in the coupling system, we review the models of plasma convection development on the basis of the ground observations and the physical ionospheric model in the 3 D global MHD simulation. It is concluded that the ionosphere would drive (not generate) the convection in the inner magnetosphere, basing on the recent result that plasma convection concurrently develops in the night side ionosphere and inner magnetosphere.

Author

Ionospheric Currents; Convection; Magnetosphere-Ionosphere Coupling; Interplanetary Magnetic Fields; Earth Ionosphere

20040013010 Communications Research Lab., Japan

Ionospheric Irregularities

Maruyama, Takashi; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 163-179; In English; See also 20040012998; Copyright; Avail: Other Sources

Ionospheric irregularities cause scintillations of trans-ionospheric radio waves from satellites. Most severe cases are the scintillations due to plasma bubbles at low latitudes near the magnetic equator, which results in fluctuations of L-band radio signals by 20 dB or more. For the prediction of onsets of plasma bubbles, investigation of a physical mechanism is indispensable. Also precursory phenomena of bubble onsets will be valid for the prediction. This article describes outstanding problems for the prediction of severe ionospheric scintillations and an ongoing observational approach in CRL.

Author

Ionospheric Disturbances; Thermosphere; Radio Waves; Scintillation; Plasma Bubbles

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20040010395 Meteorological Satellite Center, Kiyose, Japan

Monthly Report of the Meteorological Satellite Center: August 2003

August 2003; In English; In Japanese; Document files and Satellite data are recorded in either ASCII or shift JIS code; Full Disk Earth's Cloud Images are recorded in Bit-Map (BMP) format; Copyright; Avail: Other Sources

The CD-ROM concerning the August 2003 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.

Derived from text

Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20040010396 Meteorological Satellite Center, Kiyose, Japan

Monthly Report of the Meteorological Satellite Center: July 2003

July 2003; In English; In Japanese; Document files and Satellite data are recorded in either ASCII or shift JIS code; Full Disk Earth's Cloud Images are recorded in Bit-Map (BMP) format; Copyright; Avail: Other Sources

The CD-ROM concerning the July 2003 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.

Derived from text

Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20040010592 Lunar and Planetary Inst., Houston, TX, USA

ICESat: Ice, Cloud, and Land Elevation Satellite

Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fifteen thousand years ago, huge ice sheets covered much of North America and parts of Eurasia. As climate warmed during the end of the ice age, sea level rose. We do not know, however, whether the amount of water returned to the oceans in icebergs and runoff balances the snow accumulation. If the ice sheets are shrinking they would be causing the sea level to rise. The Ice, Cloud, and Land Elevation Satellite (IceSat) will measure the elevation of Earth's land surface with unprecedented accuracy and global coverage. Changes in land elevation, which can be determined during the life of ICESat, will be especially valuable. Carried aboard the ICESat satellite will be the Geoscience Laser Altimeter System (GLAS), an integral part of the Earth Science Enterprise. GLAS is a facility instrument designed to measure ice-sheet topography and associated temporal changes, as well as cloud and atmospheric properties. In addition, operation of GLAS over land and water will provide along-track topography.

Author

Ice, Cloud and Land Elevation Satellite; Meteorological Parameters; Atmospheric Chemistry; Cloud Physics; Earth Surface

20040010593 NASA Ames Research Center, Moffett Field, CA, USA

Measuring Temperature Reading

Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Original contains color and black and white illustrations

Report No.(s): NASA/EG-2002-10-001-ARC; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There are two requirements for taking a measurement of something. The first is a tool for taking a measurement. The second is scale for making sense of the numbers of the measurement. For example, a ruler is often used to measure short lengths. It is the tool for measurement. On the ruler are one or more number scales with equally spaced numbers. These numbers can be compared with numbers from any other ruler that is accurately set to the same scale. Measuring length is far simpler than measuring temperature. While there is evidence of tools for measuring length at various times in human history, tools and scales for measuring temperature do not appear until more recent human history. Early thermometers, called thermoscopes, first appear in the 1500's. They were crude instruments that were not at all accurate. Most did not even have a number scale associated with them. This made them useless for most practical purposes. Gabriel Fahrenheit created the first accurate thermometer in 1714, and the Fahrenheit temperature scale followed it in 1724. The thermometer's accuracy was based on its use of mercury, a silver colored substance that remains liquid over a wide range of temperatures but expands or contracts in a standard, predictable way with changes in temperature. To set the scale, Fahrenheit created the coldest temperature that he could. He mixed equal parts of ice, water, and salt, and then used this as the zero point, 0 degrees, of his scale. He intended to make 30 degrees the freezing point of water and 90 degrees the temperature of the human body, but he had to later revise these temperatures to be 32 degrees and 96 degrees. In the final version of the scale, the temperature of the human body became 98.6 degrees. 19th century thermoscope

Author

Temperature Measurement; Temperature Scales; Thermometers; Melting Points

20040010687 Oak Ridge National Lab., TN, USA, North Carolina Univ., Greensboro, NC, USA

Vorticity-Divergence Global Semi-Lagrangian Spectral Model for the Shallow Water Equations

Drake, J. B.; Guo, D. X.; Nov. 29, 2001; 50 pp.; In English

Report No.(s): DE2003-814342; ORNL/TM-2001/216; No Copyright; Avail: Department of Energy Information Bridge

The shallow water equations modeling flow on a sphere are useful for the development and testing of numerical algorithms for atmospheric climate and weather models. A new formulation of the shallow water equations is derived which exhibits an advective form for the vorticity and divergence. This form is particularly well suited for numerical computations using a semi-Lagrangian spectral discretization. A set of test problems, standard for the shallow water equations on a sphere, are solved and results compared with an Eulerian spectral model. The semi-Lagrangian transport method was introduced into atmospheric modeling by Robert, Henderson, and Turnbull. A formulation based on a three time level integration scheme in conjunction with a finite difference spatial discretization was studied by Ritchie. Two time level grid point schemes were derived by Bates et al. Staniforth and Cote survey developments of the application of semi-Lagrangian transport (SLT) methods for shallow water models and for numerical weather prediction.

NTIS

Atmospheric Models; Climate Models; Computational Grids

20040010694 Environmental Protection Agency, Research Triangle Park, NC

Implementation of an Urban Canopy Parameterization in MM5 for Meso-Gamma-Scale Air Quality Modeling Applications

Otte, T. L.; Lacser, A.; 2003; 8 pp.; In English

Report No.(s): PB2004-101301; EPA/600/A-03/041; No Copyright; Avail: CASI; [A02](#), Hardcopy

The USA Environmental Protection Agency (U.S. EPA) is extending its Models-3/Community Air Quality (CMAQ) Modeling System to provide detailed gridded air quality concentration fields and sub-grid variability characterization at neighborhood scales and in urban areas. CMAQ is an advanced air quality modeling system that embodies a 'one-atmosphere,' multiple-pollutant philosophy. The meteorological model used with CMAQ in this application is the Pennsylvania State University/National Center for Atmospheric Research (PSU/NCAR) Mesoscale Model (MM5). For fine-scale urban simulations (approximately 1-km grid spacing), MM5 is being modified to include an urban canopy parameterization that accounts for the drag exerted by the urban structures on the flow, the enhancement of turbulent kinetic energy especially near the top of the buildings, and the energy budget at the street and roof levels. This refinement is targeted to provide CMAQ with the means to capture the details of the pollutant spatial distributions at these scales. One of the goals of this research is to demonstrate the capability of MM5 to simulate the effects of urban areas at the meso-gamma scale. Preliminary experiments with the 'off-the-shelf' MM5 were performed with various physics options in the coarser domains (e.g., 36, 12, and 4 km) to provide a baseline for comparing with the 1.33-km simulations. This paper will show sensitivities of the predicted meteorological variables to grid sizes and illustrate the utility of the urban canopy parameterization through comparisons with measurements. Ultimately, the urban canopy parameterization will be expanded to use more detailed land use databases than

currently available in MM5, and it will include better-resolved urban morphology to identify urban terrain zones.
NTIS

Atmospheric Models; Cities

20040010740 Science and Engineering Associates, Inc., Albuquerque, NM

Summary of the Cloud Tracking and Sampling Experiments Conducted During the DIPOLE ORBIT and DIPOLE EAST Experiments

Seebaugh, William R.; Mansell, Dennis N.; Jun. 2003; 105 pp.; In English

Contract(s)/Grant(s): DNA001-93-C-0138

Report No.(s): AD-A418819; LRDA-TR-211-8261-3102-001; DSWA-TR-98-31; No Copyright; Avail: CASI; [A06](#), Hardcopy

Cloud tracking and sampling experiments were conducted for DIPOLE ORBIT and DIPOLE EAST events as a part of the Collateral Effects Experiments in an effort of the Defense Special Weapons Agency's Collateral Effects Programs to develop the capability to predict collateral effects from strikes on biological and chemical facilities. The results are summarized and analyzed.

DTIC

Chemical Warfare; Biological Weapons; Clouds (Meteorology)

20040012639 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA's Scientific Agenda for GPM Mission

Smith, Eric A.; [2003]; 52 pp.; In English; ESA/ESTEC Meeting, 24-26 Jun. 2003, Noordwijk, Netherlands; No Copyright; Avail: CASI; [A04](#), Hardcopy

The objectives of the Global Precipitation Measurement (GPM) Mission are to: 1) Understand the horizontal and vertical structure of rainfall, its macro- and micro-physical nature, and its associated latent heating, 2) Train and calibrate retrieval algorithms for constellation radiometers, 3) Provide sufficient global sampling to significantly reduce uncertainties in short-term rainfall accumulations, and 4) Extend scientific and societal applications. The GPM mission design consists of a core satellite, constellation satellites, precipitation validation sites for error characterization, and a precipitation processing center. This viewgraph presentation profiles the science goals of the mission, and its capability for producing climate data and weather predictions.

CASI

Meteorological Satellites; Rain; Vertical Distribution; Horizontal Distribution

20040012771 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Validation of Envisat Ozone Data Products using Satellite and Ground Based Data

Hilsenrath, E.; Bojkov, B. R.; Labow, G.; Flynn, L.; [2003]; 1 pp.; In English; IGARSS 2003, 21-25 Jul. 2003, Toulouse, France; No Copyright; Avail: Other Sources; Abstract Only

The Envisat chemistry instruments provide an opportunity to continue the ozone data sets produced by TOMS, SBUV, HALOE, and SAGE. These data sets have already been extensively validated and are assured to be of high accuracy. Continuity and consistency of data sets among the various satellite instruments as well as ground networks is essential for detecting an ozone recovery and climate change. Our objective, as part of the Envisat CaWal program, is to validate SCIAMACHY, MIPAS, and GOMOS ozone products using these heritage instruments. In addition we plan to validate SCIAMACHY Level 1 radiance using heritage satellite data and ground observations using a radiative transfer model. Ground based data included US ozonesonde profiles and a double monochromator Brewer instrument located at Goddard Space Flight Center. To date we have tested our intercomparisons algorithms using available Envisat data compared with SBW/2 and the ground based observations. We analyzed the comparisons with respect to ozone amounts and latitude and found the differences that were expected based on the initial release of Envisat data, which had known deficiencies. We will present our latest results based on the most current release of Envisat ozone data products.

Author

Ozone; Envisat-1 Satellite; Detection; Satellite-Borne Instruments

20040012813 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Use of Collocated KWAJEX Satellite, Aircraft, and Ground Measurements for Understanding Ambiguities in TRMM Radiometer Rain Profile Algorithm

Smith, Eric A.; Fiorino, Steven; [2002]; 1 pp.; In English; American Meteorological Society, 83rd Annual Meeting, 9-13 Feb. 2003, Long Beach, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Coordinated ground, aircraft, and satellite observations are analyzed from the 1999 TRMM Kwajalein Atoll field experiment (KWAJEX) to better understand the relationships between cloud microphysical processes and microwave radiation intensities in the context of physical evaluation of the Level 2 TRMM radiometer rain profile algorithm and uncertainties with its assumed microphysics-radiation relationships. This talk focuses on the results of a multi-dataset analysis based on measurements from KWAJEX surface, air, and satellite platforms to test the hypothesis that uncertainties in the passive microwave radiometer algorithm (TMI 2a12 in the nomenclature of TRMM) are systematically coupled and correlated with the magnitudes of deviation of the assumed 3-dimensional microphysical properties from observed microphysical properties. Re-stated, this study focuses on identifying the weaknesses in the operational TRMM 2a12 radiometer algorithm based on observed microphysics and radiation data in terms of over-simplifications used in its theoretical microphysical underpinnings. The analysis makes use of a common transform coordinate system derived from the measuring capabilities of the aircraft radiometer used to survey the experimental study area, i.e., the 4-channel AMPR radiometer flown on the NASA DC-8 aircraft. Normalized emission and scattering indices derived from radiometer brightness temperatures at the four measuring frequencies enable a 2-dimensional coordinate system that facilitates compositing of Kwajalein S-band ground radar reflectivities, ARMAR Ku-band aircraft radar reflectivities, TMI spacecraft radiometer brightness temperatures, PR Ku-band spacecraft radar reflectivities, bulk microphysical parameters derived from the aircraft-mounted cloud microphysics laser probes (including liquid/ice water contents, effective liquid/ice hydrometeor radii, and effective liquid/ice hydrometeor variances), and rainrates derived from any of the individual ground, aircraft, or satellite algorithms applied to the radar or radiometer measurements, or their combination. The results support the study's underlying hypothesis, particularly in context of ice phase processes, in that the cloud regions where the 2a12 algorithm's microphysical database most misrepresents the microphysical conditions as determined by the laser probes, are where retrieved surface rainrates are most erroneous relative to other reference rainrates as determined by ground and aircraft radar. In reaching these conclusions, TMI and PR brightness temperatures and reflectivities have been synthesized from the aircraft AMPR and ARMAR measurements with the analysis conducted in a composite framework to eliminate measurement noise associated with the case study approach and single element volumes obfuscated by heterogeneous beam filling effects. In diagnosing the performance of the 2a12 algorithm, weaknesses have been found in the cloud-radiation database used to provide microphysical guidance to the algorithm for upper cloud ice microphysics. It is also necessary to adjust a fractional convective rainfall factor within the algorithm somewhat arbitrarily to achieve satisfactory algorithm accuracy.

Author

Algorithms; Rain; Trmm Satellite; Ambiguity; Cloud Physics; Microwave Radiometers

20040012820 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data

Leftwich, T. E.; vonFrese, R. R. B.; Potts, L. V.; Roman, D. R.; Taylor, P. T.; [2003]; 38 pp.; In English; Icelandic Plume and Crust Symposium, 8-10 Sep. 2001, Reykjanes Peninsula, Iceland

Contract(s)/Grant(s): NAG5-7645; Copyright; Avail: CASI; A03, Hardcopy

Seismic refraction studies have provided critical, but spatially restricted constraints on the structure of the Icelandic crust. To obtain a more comprehensive regional view of this tectonically complicated area, we spectrally correlated free-air gravity anomalies against computed gravity effects of the terrain for a crustal thickness model that also conforms to regional seismic and thermal constraints. Our regional crustal thickness estimates suggest thickened crust extends up to 500 km on either side of the Greenland-Scotland Ridge with the Iceland-Faeroe Ridge crust being less extended and on average 3-5 km thinner than the crust of the Greenland-Iceland Ridge. Crustal thickness estimates for Iceland range from 25-35 km in conformity with seismic predictions of a cooler, thicker crust. However, the deepening of our gravity-inferred Moho relative to seismic estimates at the thermal plume and rift zones of Iceland suggests partial melting. The amount of partial melting may range from about 8% beneath the rift zones to perhaps 20% above the plume core where mantle temperatures may be 200-400 C above normal. Beneath Iceland, areally limited regions of partial melting may also be compositionally and mechanically layered and intruded. The mantle plume appears to be centered at (64.6 deg N, 17.4 deg W) near the Vatnajökull Glacier and the central Icelandic neovolcanic zones.

Author

Crusts; Iceland; Spectra; Free Atmosphere; Gravitation

20040012843 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Remote Sensing of Aerosol using MODIS, MODIS+CALIPSO and with the AEROSAT Concept

Kaufman, Yoram J.; [2003]; 1 pp.; In English; Aerosol-Cloud-Precip Science Workshop, 5-7 Aug. 2003, Ventura Beach, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

In the talk I shall review the MODIS use of spectral information to derive aerosol size distribution, optical thickness and reflected spectral flux. The accuracy and validation of the MODIS products will be discussed. A few applications will be shown: inversion of combined MODIS+lidar data, aerosol Anthropogenic direct forcing, and dust deposition in the Atlantic Ocean. I shall also discuss the aerosol information that MODIS is measuring: real ref index, single scattering albedo, size of fine and coarse modes, and describe the AEROSAT concept that uses bright desert and glint to derive aerosol absorption.

Author

Aerosat Satellites; Aerosols; Remote Sensing; MODIS (Radiometry)

20040012859 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Downscaling Analysis of the Urban Influence on Rainfall: TRMM Satellite Component AMS Conference on Satellite Meteorology and Oceanography

Shepherd, J. Marshall; Burian, Steven J.; [2002]; 1 pp.; In English; AMS Conference on Satellite Meteorology and Oceanography, 9-13 Feb. 2003, Long Beach, CA, USA; Copyright; Avail: Other Sources; Abstract Only

A recent publication by Shepherd et al. (2002) demonstrated the feasibility of using TRMM precipitation radar (PR) estimates to identify precipitation anomalies caused by urbanization. The approach is particularly useful for investigating this global process because TRMM data span large portions of the globe and comprise an extended temporal dataset. Recent literature suggests that urbanized regions of Houston, Texas may be influencing lightning and precipitation formation over and downwind of the city. Possible mechanisms include: (1) enhanced convergence through interactions between the sea breeze, Galveston bay breeze, and urban heat island circulations, (2) enhanced convergence due to increased surface roughness over the city and/or destabilization of the boundary layer by the UHI, or (3) enhanced cloud condensation nuclei due to urban and industrial aerosol sources. In this study, a downscaling analysis of spatial and temporal trends in rainfall around the Houston Area is being conducted. The downscaling analysis concept involves identifying and quantifying urban rainfall anomalies at progressively smaller spatial and temporal scales using the TRMM satellite, ground-based radar, and a dense network of rain gauges. The goal is to test the hypothesis that the Houston urban district and regions in the climatological downwind region of the city exhibit enhanced rainfall amounts relative to the climatological upwind regions. TRMM was launched in 1997 and currently operates in a low-inclination (35 deg), non-sun-synchronous orbit at an altitude of 402 km (350 km prior to August 2001). The satellite analysis follows the methodologies described in Shepherd et al. (2002). Nearly five years of TRMM PR-derived mean monthly rainfall estimates are utilized to produce annual and warm season isohyetal analyses around Houston. Early results indicate that rainfall rates (mm/h) for the entire period are largest within 100 km northeast and east of Houston (e.g. the 'hypothesized downwind region'). The mean rainfall rate over the Houston urban center is 30.5% larger than the upwind control region. The mean rainfall rate in the downwind region is 34.4% larger than the upwind region. An analysis of a parameter called the urban rainfall ratio (URR) illustrates that 65% (88%) of the satellite-derived rainfall rates in the downwind (upwind control) region are greater (less) than the mean background rainfall rate of the entire study region. When the data is stratified by summer months from 1998 to 2001 (June-August), even greater influence over and downwind of the urban area is observed in the statistics. This result is consistent with published reports of urban-generated rainfall being more prevalent in the warm season. The research demonstrates that the evolving TRMM satellite climatology is a credible way to detect mesoscale precipitation signatures that may be linked to urbanization. Early results also corroborate recent findings on Houston-induced convection/drainfall anomalies. Burian and Shepherd will report on other aspects of the downscaling analysis in future forums, but early rain gauge results are consistent with the satellite-based observations.

Author

Aerosols; Cities; Climatology; Meteorological Radar; Precipitation (Meteorology); Rain

20040012863 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space

Hou, Arthur; Zhang, Sara; Li, Jui-Lin; Reale, Oreste; [2002]; 1 pp.; In English; American Meteorological Society Annual Meeting, 9-13 Feb. 2003, Long Beach, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Progress in understanding of the role of water in global weather and climate is currently limited by our knowledge of the spatial and temporal variability of primary hydrological fields such as precipitation and evaporation. The Tropical Rainfall Measuring Mission (TRMM) has recently demonstrated that use of microwave-based rainfall observations from space in data assimilation can provide better climate data sets and improve short-range weather forecasting. At NASA, we have been exploring non-traditional approaches to assimilating TRMM Microwave Imager (TMI) and Special Sensor Microwavehager (SSM/I) surface rain rate and latent heating profile information in global systems. In this talk we show that assimilating microwave rain rates using a continuous variational assimilation scheme based on moisture tendency corrections improves quantitative precipitation estimates (QPE) and related clouds, radiation energy fluxes, and large-scale circulations in the

Goddard Earth Observing System (GEOS) reanalyses. Short-range forecasts initialized with these improved analyses also yield better QPE scores and storm track predictions for Hurricanes Bonnie and Floyd. We present a status report on current efforts to assimilate convective and stratiform latent heating profile information within the general variational framework of model parameter estimation to seek further improvements. Within the next 5 years, there will be a gradual increase in microwave rain products available from operational and research satellites, culminating to a target constellation of 9 satellites to provide global rain measurements every 3 hours with the proposed Global Precipitation Measurement (GPM) mission in 2007/2008. Based on what has been learned from TRMM, there is a high degree of confidence that these observations can play a major role in improving weather forecasts and producing better global datasets for understanding the Earth's water and energy cycle. The key to success is to adopt an integrated approach to retrieval, validation, modeling, and data assimilation in a coordinated end-to-end observation-application program.

Author

Climatology; Precipitation (Meteorology); Rain; Trmm Satellite; Weather Forecasting

20040012866 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Leveraging Improvements in Precipitation Measuring from GPM Mission to Achieve Prediction Improvements in Climate, Weather and Hydrometeorology

Smith, Eric A.; [2002]; 1 pp.; In English; American Meteorological Society, 83rd Annual Symposium on Observing and Understanding the Variability of Water in Weather and Climate, 9-13 Feb. 2003, Long Beach, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The main scientific goal of the GPM mission, currently planned for start in the 2007 time frame, is to investigate important scientific problems arising within the context of global and regional water cycles. These problems cut across a hierarchy of scales and include climate-water cycle interactions, techniques for improving weather and climate predictions, and better methods for combining observed precipitation with hydrometeorological prediction models for applications to hazardous flood-producing storms, seasonal flood/draught conditions, and fresh water resource assessments. The GPM mission will expand the scope of precipitation measurement through the use of a constellation of some 9 satellites, one of which will be an advanced TRMM-like 'core' satellite carrying a dual-frequency Ku-Ka band precipitation radar and an advanced, multifrequency passive microwave radiometer with vertical-horizontal polarization discrimination. The other constellation members will include new dedicated satellites and co-existing Operational/research satellites carrying similar (but not identical) passive microwave radiometers. The goal of the constellation is to achieve approximately 3-hour sampling at any spot on the globe. The constellation's orbit architecture will consist of a mix of sun-synchronous and non-sun-synchronous satellites with the core satellite providing measurements of cloud-precipitation microphysical processes plus calibration-quality rainrate retrievals to be used with the other retrieval information to ensure bias-free constellation coverage. GPM is organized internationally, currently involving a partnership between NASA in the US and the National Space Development Agency in Japan. Additionally, the program is actively pursuing agreements with other international partners and domestic scientific agencies and institutions, as well as participation by individual scientists from academia, government, and the private sector to fulfill mission goals and to pave the way for what ultimately is expected to become an internationally-organized operational global precipitation observing system. Notably, the broad societal applications of GPM are reflected in the United Nations identification of this mission as a foremost candidate for its Peaceful Uses of Space Program. In this presentation, an overview of the GPM mission design will be presented, followed by an explanation of its scientific agenda as an outgrowth of making improvements in rain retrieval accuracy, microphysics dexterity, sampling frequency, and global coverage. All of these improvements offer new means to observe variability in precipitation and water cycle fluxes and to achieve improved predictability of weather, climate, and hydrometeorology. Specifically, the scientific agenda of GPM has been designed to leverage the measurement improvements to improve prognostic model performance, particularly quantitative precipitation forecasting and its linked phenomena at short, intermediate, and extended time scales. The talk will address how GPM measurements will enable better detection of accelerations and decelerations in regional and global water cycle processes and their relationship to climate variability, better impacts of precipitation data assimilation on numerical weather prediction and global climate reanalysis, and better performance from basin scale hydrometeorological models for short and long term flood-drought forecasting and seasonal fresh water resource assessment. Improved hydrometeorological forecasting will be possible by using continuous global precipitation observations to obtain better closure in water budgets and to generate more realistic forcing of the models themselves to achieve more accurate estimates of interception, infiltration, evaporation/transpiration fluxes, storage, and runoff.

Author

Mathematical Models; Meteorological Radar; Precipitation Measurement; Numerical Weather Forecasting

20040012899 Swedish Defence Research Establishment, Linköping

Triggering of Convection

Hultgren, P.; Dec. 2002; In Swedish

Report No.(s): PB2004-100958; DM-88; Copyright; Avail: National Technical Information Service (NTIS)

Triggering of convection is a non-linear process where small perturbations, if they are just strong enough to reach a certain threshold, can onset cumulus convection. If the perturbation energy is large enough it can release a large amount of energy, resulting in deep convection, sometimes over many kilometers in the vertical. The onset of convection in a numerical model is governed by the formulation of the triggering function. A simple one-dimensional model has been assembled to investigate the sensitivity of the triggering mechanisms. With this approach, the different mechanisms that are involved in the triggering process can be studied separately. The model, which was built on the parcel method, calculates the energy needed to trigger convection. The result shows that the triggering process is very sensitive to the formulation of a trigger function. The vertical resolution, the size of the thermal, the boundary layer stability as well as sub-grid scale energy sources have to be taken into account in a sophisticated convection scheme. These parameters effect on the triggering are important in order to achieve a well-performing mesoscale model. The 1-D model results revealed that potential moisture perturbations are at least as important as the temperature perturbations, and have to be included in a sophisticated triggering formulation.

NTIS

Perturbation; Convection; Atmospheric Circulation

20040012900 Stockholm Univ., Sweden

Precipitation Chemistry Studies in India: A Search for Regional Patterns

Kulshrestha, U. C.; Granat, L.; Rodhe, H.; Apr. 2003; In English

Report No.(s): PB2004-100961; CM-99; Copyright; Avail: National Technical Information Service (NTIS)

In this report, a major part of the reported Indian studies of rain chemistry is reviewed as well as some of those on aerosol composition and dustfall. The validity of the data is examined from the point of view of possible errors during sampling and analysis as well as the spatial representativeness. The possibility to estimate systematic large scale spatial variation is also considered. Composition of rainwater in India with regard to major ionic components has been reported since 1965. Data from about 98 locations, some with multiple studies, have been taken from 35 published reports. Most of the measurements were made during the summer (SW) monsoon but at five of the sites (one rural) measurements continued over two full years or more. 36 of the sites were reported as having a rural location with no or small anthropogenic emission in the vicinity while the influence from local soil derived material could vary.

NTIS

Precipitation (Meteorology); Geographic Distribution; India

20040012947 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Glaciology in Antarctica

Bindschadler, Robert; [2003]; 1 pp.; In English; Polar Connections Workshop, 25-28 Sep. 2003, Edmonton, Alberta, Canada; No Copyright; Avail: Other Sources; Abstract Only

The behavior of the ice sheet remains the single most compelling research topic in Antarctic glaciology. This is being addressed through a combination of surface, airborne and satellite measurement programs. Most recently, the addition of ICESat with its laser altimeter is improving our ability to quantify where and by how the ice sheet is changing shape. Other disciplines take advantage of the ice sheet as a unique depository of climatic information. Deep ice cores for paleoclimatic data are the best known example, but a more widely distributed sampling of the ice sheet with shallower cores is providing a more detailed spatial picture of the Antarctic climate for the past 200-500 years. A number of specific examples will be shown to illustrate both of these major research thrusts along with some predictions of future research directions.

Author

Ice, Cloud and Land Elevation Satellite; Glaciology; Ice

20040012966 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood

Bosilovich, Michael; Sud, Yogesh; Walker, Gregory; Schubert, Siegfried; [2003]; 2 pp.; In English; AMS 83rd Annual Meeting, 9-13 Feb. 2003, Long Beach, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

During June and July of 1993, devastating and persistent rainfall caused substantial damage in the Midwest USA primarily focused on the Mississippi River Basin. Above normal springtime rains primed the region for flooding. The resulting wet soil

was thought to be a major source of water for the heavy summer precipitation. On the other hand, northward moisture transport was extremely intense during the summer. In this study, we have implemented passive tracers to diagnose the geographic source of water for precipitation, called Water Vapor Tracers (WVT), into the NASA Data Assimilation Office (DAO) Data Assimilation System (DAS). The WVT diagnostics can produce detailed budgets of the geographical sources of water that precipitates in any region, and they consider physical and dynamical tendencies at the model time step. The 1993 summer has been reanalyzed with the new WVT diagnostics to better understand the local and remote source of water for precipitation during the flood. Because the DAS also uses observations of water in the atmospheric hydrologic budget, we will also evaluate the impact of the observations on the local and remote sources of water in the DAS.

Author

Precipitates; Rain; River Basins; Damage; Floods; Moisture

20040012971 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Recent Observing System Simulation Experiments at the NASA DAO

Atlas, Robert; Emmitt, G. David; Terry, Joseph; Brin, Eugenia; Ardizzone, Joseph; Jusem, Juan Carlos; Bungato, Dennis; [2002]; 4 pp.; In English; AMS 83rd Annual Meeting, 9-13 Feb. 2003, Long Beach, CA, USA; Copyright; Avail: CASI; [A01](#), Hardcopy

Since the advent of meteorological satellites in the 1960's, numerous experiments have been conducted in order to evaluate the impact of these and other data on atmospheric analysis and prediction. Such studies have included both OSE's (Observing System Experiments) and OSSE's (Observing System Simulation Experiments). The OSE's were conducted to evaluate the impact of specific observations or classes of observations on analyses and forecasts. Such experiments have been performed for selected types of conventional data and for various satellite data sets as they became available. (See for example the 1989 ECMWF/EUMETSAT workshop proceedings on 'The use of satellite data in operational numerical weather prediction' and the references contained therein.) The OSSE's were conducted to evaluate the potential for future observing systems to improve Numerical Weather Prediction (NWP) and to plan for the Global Weather Experiment and more recently for EOS. In addition, OSSE's have been run to evaluate trade-offs in the design of observing systems and observing networks, and to test new methodology for data assimilation.

Author

Ducts; Forecasting; Numerical Weather Forecasting; Simulation; Weather Forecasting

20040012972 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Global Weather Prediction and High-End Computing at NASA

Lin, Shian-Jiann; Atlas, Robert; Yeh, Kao-San; August 18, 2003; 13 pp.; In English; No Copyright; Avail: CASI; [A03](#), Hardcopy

We demonstrate current capabilities of the NASA finite-volume General Circulation Model for high-resolution global weather prediction, and discuss its development path in the foreseeable future. This model can be regarded as a prototype of a future NASA Earth modeling system intended to unify development activities cutting across various disciplines within the NASA Earth Science Enterprise.

Author

Atmospheric General Circulation Models; Finite Volume Method; Weather Forecasting; Earth Sciences

20040012980 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Regional Variability in Convection and Rain Retrievals from the TRMM Microwave Imager (TMI)

Prabhakara, C.; Iacovazzi, R., Jr.; [2003]; 1 pp.; In English; International Conference of Geographic Information Systems and Remote Sensing in Hydrology, Water Resources and Environment, 16-19 Sep. 2003, Yichang City, China; Copyright; Avail: Other Sources; Abstract Only

Precipitation Radar (PR) on board the TRMM satellite shows that the average height of 30 dBz in convective rain areas of the tropics varies significantly from one region to the other. When the convection is weak this height is shallow and when convection is strong this height extends deeper into the troposphere. The brightness temperature (Tb) measured by the microwave radiometer by itself does not reflect this nature of convection satisfactorily. Radiative transfer simulations of Tbs reveal that this could be due to the variations in the vertical distribution of optically active water and ice hydrometeors and their density, shape, and size. These variations are not coupled uniquely to the strength of the convective updrafts, and as a result the Tbs do not reflect properly the convective strength indicated by PR. Because of this deficiency in the Tbs the rain rate deduced from them differs from that of PR. For this reason, to improve the estimation of rain rate we have developed an

empirical method. In this method a parameter based on the areal extent of the Tbs that exceed a certain magnitude is included along with the Tbs. Rain rate deduced with this approach is better correlated with that of PR when compared to the current Version 5 operational algorithm. The percentage of rain volume as a function of rain rate, for a given region of 5deg lat. X 5deg long. over a period of three months, deduced from this method, is also in better agreement with that of the PR.

Author

Convection; Precipitation (Meteorology); Rain; Brightness Temperature; Radiative Transfer; Vertical Air Currents

20040012982 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Equation for Moist Entropy in a Precipitating and Icy Atmosphere

Tao, Wei-Kuo; Simpson, Joanne; Zeng, Xiping; [2003]; 37 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

Moist entropy is nearly conserved in adiabatic motion. It is redistributed rather than created by moist convection. Thus moist entropy and its equation, as a healthy direction, can be used to construct analytical and numerical models for the interaction between tropical convective clouds and large-scale circulations. Hence, an accurate equation of moist entropy is needed for the analysis and modeling of atmospheric convective clouds. On the basis of the consistency between the energy and the entropy equations, a complete equation of moist entropy is derived from the energy equation. The equation expresses explicitly the internal and external sources of moist entropy, including those in relation to the microphysics of clouds and precipitation. In addition, an accurate formula for the surface flux of moist entropy from the underlying surface into the air above is derived. Because moist entropy deals 'easily' with the transition among three water phases, it will be used as a prognostic variable in the next generation of cloud-resolving models (e.g. a global cloud-resolving model) for low computational noise. Its equation that is derived in this paper is accurate and complete, providing a theoretical basis for using moist entropy as a prognostic variable in the long-term modeling of clouds and large-scale circulations.

Author

Entropy; Clouds (Meteorology); Atmospheric Models; Ice

20040012988 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Insights into Tropical Tropospheric Ozone from the SHADOZ Network

Thompson, A. M.; Witte, J. C.; Schmidlin, F. J.; Oltmans, S. J.; [2002]; 1 pp.; In English; AMS 83rd Annual Meeting, 9-13 Feb. 2003, Long Beach, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The first view of lower stratospheric and upper tropospheric structure from sondes is provided by a 3-year, 10-site record from the Southern Hemisphere ADditional OZonesondes (SHADOZ) network: http://code916.gsfc.nasa.gov/Data_services/shadoz. Observations covering 1998-2000 were made over Ascension Island; Nairobi, Kenya; Irene, South Africa; La Reunion Island; Watukosek, Java; Fiji; Tahiti; American Samoa; San Cristobal, Galapagos; Natal, Brazil. Taking the UT/LS (upper troposphere-lower stratosphere) as the region between 12 and 17 km, we examine ozone variability in this region on a week-to-week and seasonal basis. The tropopause is lower in September-October-November than in March-April-May, when ozone is a minimum at most SHADOZ stations. A zonal wave-one pattern (referring to ozone mixing ratios greater over the Atlantic and adjacent continents than over the Pacific and eastern Indian Ocean), persists all year. The wave, predominantly in the troposphere and with variable magnitude, appears to be due to general circulation - with subsidence over the Atlantic and frequent deep convection over the Pacific and Indian Ocean. The variability of deep convection - most prominent at Java, Fiji, Samoa and Natal - is explored in time-vs-altitude ozone curtains. Stratospheric incursions into the troposphere are most prominent in soundings at Irene and Reunion Island.

Author

Ozone; Tropical Regions; Troposphere; Sondes; Southern Hemisphere

20040012991 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Tagging Water Sources in Atmospheric Models

Bosilovich, M.; [2003]; 1 pp.; In English; 9th Global Energy and Water Experiment Panel Meeting, 22-26 Sep. 2003, Geesthacht, Germany; No Copyright; Avail: Other Sources; Abstract Only

Tagging of water sources in atmospheric models allows for quantitative diagnostics of how water is transported from its source region to its sink region. In this presentation, we review how this methodology is applied to global atmospheric models. We will present several applications of the methodology. In one example, the regional sources of water for the North American Monsoon system are evaluated by tagging the surface evaporation. In another example, the tagged water is used to quantify

the global water cycling rate and residence time. We will also discuss the need for more research and the importance of these diagnostics in water cycle studies.

Author

Water; Atmospheric Models; Evaporation; Marking

20040012996 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Westerly Wind Events in the Eastern Indian Ocean as a Precursor to El Nino: A Case Study for the 2002-03 El Nino

Curtis, Scott; Adler, Robert F.; Huffman, George J.; Gu, Guojun; [2003]; 32 pp.; In English; No Copyright; Avail: CASI; [A03](#), Hardcopy

This paper extends the work of our previous study, which showed the potential of using precipitation in the eastern Indian Ocean to predict when an El Nino would begin. The paper begins by showing the successful prediction of the 2002-03 El Nino. However, precipitation is really used as a substitute for wind (storms are usually accompanied by heavy wind), because a popular hypothesis is that winds (especially % winds out of the West) stir up the ocean surface in the western Pacific sending currents of warm waters to the east Pacific where El Ninos form. This paper shows that it is typical for storms that produce strong winds in the western Pacific to have traveled from the Indian Ocean. We begin in the Indian Ocean looking at strong bursts of wind over several days. The number of windy days seems to increase in the months prior to El Nino. We examined these relationships in detail for November 2001 to April 2002, before the recent El Nino, using NASA's TRMM and QuikSCAT data. We found in one case that a warming of the eastern Indian Ocean occurred about 25 days before heavy rainfall formed. As the storm moved eastward it was followed (6 days later) by strong winds out of the West. The entire storm system (and warming of the sea) moved eastward through a small strip of water between Indonesia and Australia, before reaching the western Pacific. Thus, this paper increases our understanding of the physical processes leading to the formation of El Nino.

Author

El Nino; Ocean Surface; Rain; Predictions

48

OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20040012779 NASA Goddard Space Flight Center, Greenbelt, MD, USA

ICESat's Laser Measurements of Polar Ice, Atmosphere, Ocean, and Land

Zwally H. Jay; [2003]; 1 pp.; In English; IGARSS 2003, 21-25 Jul. 2003, Toulouse, France; No Copyright; Avail: Other Sources; Abstract Only

NASA's Ice, Cloud and Land Elevation Satellite (ICESat) mission is designed to measure changes in elevation of the Greenland and Antarctic ice sheets beginning in January 2003. Time-series of elevation changes will enable determination of the present-day mass balance of the ice sheets, study of associations between observed ice changes and polar climate, and estimation of the present and future contributions of the ice sheets to global sea level rise. Other scientific objectives of ICESat include: global measurements of cloud heights and the vertical structure of clouds and aerosols; precise measurements of land topography and vegetation canopy heights; and measurements of sea ice roughness, sea ice thickness, ocean surface elevations, and surface reflectivity. The Geoscience Laser Altimeter System (GLAS) on ICESat has a 1064 nm laser channel for surface altimetry and dense cloud heights and a 532 nm lidar channel for the vertical distribution of clouds and aerosols. Differences between the characteristics of laser and radar altimetry, such as effective depth of the backscattered signal, elevation accuracy, and footprint location, and their relevance to inter-relating measurements from ERS, Envisat, ICESat, and Cryosat are discussed. Preliminary ICESat results obtained during the calibration and validation period of ICESat are described. ICESat is designed to operate for 3 to 5 years and should be followed by successive missions to measure ice changes for at least 15 years.

Author

Antarctic Regions; Geophysics; Ice, Cloud and Land Elevation Satellite; Topography; Laser Altimeters

20040013011 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms

Essias, Wayne E.; Abbott, Mark; Carder, Kendall; Campbell, Janet; Clark, Dennis; Evans, Robert; Brown, Otis; Kearns, Ed; Kilpatrick, Kay; Balch, W., et al.; [2003]; 1 pp.; In English; IGARSS2003, 21-25 Jul. 2003, Toulouse, France; No Copyright; Avail: Other Sources; Abstract Only

Simplistic models relating global satellite ocean color, temperature, and light to ocean net primary production (ONPP) are sensitive to the accuracy and limitations of the satellite estimate of chlorophyll and other input fields, as well as the primary productivity model. The standard MODIS ONPP product uses the new semi-analytic chlorophyll algorithm as its input for two ONPP indexes. The three primary MODIS chlorophyll Q estimates from MODIS, as well as the SeaWiFS 4 chlorophyll product, were used to assess global and regional performance in estimating ONPP for the full mission, but concentrating on 2001. The two standard ONPP algorithms were examined with 8-day and 39 kilometer resolution to quantify chlorophyll algorithm dependency of ONPP. Ancillary data (MLD from FNMOC, MODIS SSTD1, and PAR from the GSFC DAO) were identical. The standard MODIS ONPP estimates for annual production in 2001 was 59 and 58 GT C for the two ONPP algorithms. Differences in ONPP using alternate chlorophylls were on the order of 10% for global annual ONPP, but ranged to 100% regionally. On all scales the differences in ONPP were smaller between MODIS and SeaWiFS than between ONPP models, or among chlorophyll algorithms within MODIS. Largest regional ONPP differences were found in the Southern Ocean (SO). In the SO, application of the semi-analytic chlorophyll resulted in not only a magnitude difference in ONPP (2x), but also a temporal shift in the time of maximum production compared to empirical algorithms when summed over standard oceanic areas. The resulting increase in global ONPP (6-7 GT) is supported by better performance of the semi-analytic chlorophyll in the SO and other high chlorophyll regions. The differences are significant in terms of understanding regional differences and dynamics of ocean carbon transformations.

Author

Ocean Dynamics; Imaging Spectrometers; Algorithms; Chlorophylls; Oceans

51

LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20040008561 Purdue Univ., West Lafayette, IN, USA

In Vivo Testing of Chemopreventive Agents Using the Dog Model of Spontaneous Prostate Carcinogenesis

Waters, David J.; Mar. 2003; 32 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-98-1-8550

Report No.(s): AD-A418684; No Copyright; Avail: CASI; [A03](#), Hardcopy

The goal of this research was to demonstrate the feasibility of the dog model of spontaneous prostate carcinogenesis as a valuable model system to evaluate chemopreventive agents. From April 1, 2002 to March 31, 2003, we have further defined the anticancer effects of the trace mineral selenium on the aging prostate. Our work has generated the first evidence of a non-linear, U-shaped dose : response relationship between selenium status and DNA damage within the prostate. Importantly, the dose : response curve from elderly beagle dogs accurately predicts the relationship between selenium status and prostate cancer risk in men. In our Phase II proposal, we are focusing on interactions between selenium and the antiandrogen, finasteride. To accomplish this, we will conduct a 6 month intervention trial using 60 dogs. At the time of this report, 35 dogs have undergone prostatic biopsy and have been randomly assigned to receive no treatment, selenium alone, finasteride alone, or selenium plus finasteride. Interventions were well tolerated by all dogs. Additional dogs to complete this task will be studied during the project's approved 12 month extension period. Results of biomarker analysis on tissues and body fluids collected pre- treatment, during the experimental period, and at time of euthanasia are pending. Our experience indicates the dog model provides a useful system to study the effects of cancer preventive agents on prostate cells in an appropriate context - in vivo within an aging prostate.

DTIC

Prostate Gland; Cancer; Dogs; Chemotherapy

20040008599 Brigham and Women's Hospital, Boston, MA

Drug Discovery for Breast Cancer by Mirror-Image Display

Blacklow, Stephen C.; Jul. 2003; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0163

Report No.(s): AD-A418720; No Copyright; Avail: CASI; [A03](#), Hardcopy

Two limitations inherent in phage display are the relatively small library size (less than 10⁹) and the constraint that the building blocks of the library be restricted to the 20 naturally-occurring amino acids. These constraints likely prevented us from identifying ligands for the MUC-1 target from two different phage display libraries, and we have therefore been compelled to seek an alternative method for the presentation of larger and more diverse libraries of potential ligands to the MUC-1 target. The purified translation system we have developed has the potential to overcome both restrictions, encumbering phage display because of a much larger library size and an expanded range of unnatural amino acid building blocks beyond the 20 naturally-occurring amino acids. We have now demonstrated that our purified translation system is capable of synthesizing peptidomimetics with unnatural amino acids encoded at sequential positions of the oligomer. A library of such peptidomimetics should overcome the inherent limitations of mirror image display that requires chemically synthesized small targets.

DTIC

Image Processing; Display Devices; Drugs; Mammary Glands; Cancer

20040008604 Mayo Clinic, Rochester, MN

Functional Analysis of Interactions Between 53BP1, BRCA1 and p53

Ward, Irene M.; Jul. 2003; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0317

Report No.(s): AD-A418734; No Copyright; Avail: CASI; [A03](#), Hardcopy

53BP1 has been suggested to play a role in DNA damage recognition and/or repair. We could show that upon exposure of cells to ionizing radiation, 53BP1 rapidly colocalizes with phosphorylated H2AX (g-H2AX) in megabase regions surrounding the sites of DNA strand breaks. The 53BP1 region required and sufficient for 53BP1 foci formation lies upstream of the 53BP1 C-terminus and binds to phosphorylated but not unphosphorylated H2AX in vitro. Moreover, phosphorylation of H2AX at S140 is critical for 53BP1 foci formation implying that a direct interaction between 53BP1 and g-H2AX is required for the accumulation of 53BP1 at DNA break sites. On the other hand, radiation-induced phosphorylation of the 53BP1 N-terminus by the ATR kinase is not essential for 53BP1 foci formation and occurs independently of 53BP1 redistribution. To further investigate the physiological role of 53BP1 we produced a targeted disruption of mouse 53BP1. 53BP1-deficient mice are radiation sensitive, growth retarded and immunodeficient. In addition, 53BP1^{-/-} mice show a higher incidence of developing thymic lymphomas suggesting that 53BP1 plays a role in tumor suppression.

DTIC

Cancer; Genes; In Vitro Methods and Tests; Phosphorylation; Tumors

20040008619 Arizona Univ., Tucson, AZ

A Molecular Model for Repression of BRCA-1 Transcription by the Aryl Hydrocarbon Receptor

Romagnolo, Donato F.; Jul. 2003; 14 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0130

Report No.(s): AD-A418719; No Copyright; Avail: CASI; [A03](#), Hardcopy

The purpose of this project is to investigate whether or not expression of the BRCA-1 gene in breast epithelial cells exposed to polycyclic aromatic hydrocarbons (PAHs) is mediated by the aryl hydrocarbon receptor (AhR). The scope of the project is to examine whether or not the activated AhR alters BRCA-1 transcription through binding to several xenobiotic responsive elements (XRE) strategically located at -539 bp (CCGTFFAA=CyplAl-like) and +20 base pairs (bp) (GCGTG=XRE-1) from the transcription start site on exon-1A. Two additional XREs (GCGTG) have been localized at -107 bp in the intervening sequence upstream (XRE-2) and +218 bp (XRE-3) into exon 1B. Findings of the experiments conducted in year 3 were: 1) Completed testing of truncation constructs for the BRCA-1 promoter region flanking XRE-3. 2) Investigated the effects of the AhR ligands TCDD and alpha-naphthoflavone (ANF) on estrogen regulation of the BRCA-1 gene. 3) Investigated the cross-talk between the estrogen receptor and the AhR pathways. Results of these experiments indicate that XRE-3 is a negative regulator of BRCA-1 transcription. Treatment with TCDD or ANF represses estrogen stimulation of BRCA-1 transcription suggesting that AhR ligands exert negative effect on BRCA-1 expression. We also have gained

evidence that the ER- α is recruited at the XREs flanked in the BRCA-1 promoter.

Author

Polycyclic Aromatic Hydrocarbons; Aromatic Compounds; Genes; Mammary Glands; Cancer; Radicals

20040008666

Identification of Secondary Mutations Which Enhance and Stabilize the Attenuation of Brucella HTRA Mutants: Improving Brucella HTRS-Based Strains as Vaccine

Cardelli, James A.; Aug. 2003; 29 pp.; In English

Contract(s)/Grant(s): DAMD17-98-C-8045

Report No.(s): AD-A418723; No Copyright; Avail: CASI; [A03](#), Hardcopy

Prolonged residence in the phagosomal compartment of host macrophages is essential for the establishment and maintenance of chronic infection by the brucellae in mammalian hosts. The intracellular brucellae are exposed to a variety of environmental stresses in this compartment, including nutrient deprivation and exposure to low pH and reactive oxygen intermediates. Correspondingly, a significant degree of physiologic adaptation is required in order for these bacteria to survive for prolonged periods within this niche. Studies described in this report indicate that the *Erucelia* genes that contribute to this physiologic adaptation represent good targets for use in the construction of vaccine candidates. Specifically, these studies have further verified the importance of de novo purine biosynthesis for intracellular survival and replication in host macrophages. Studies described in this report have also determined that the *Brucella* BacA is required for proper acylation of the lipid A component of the LPS. Finally, studies employing the human monocyte-like cell line indicate that a) virulent *B. abortus* 2308 inhabits two different types of replicative vacuoles in these phagocytes b) the isogenic hfq mutant Hfq3 is trafficked like 2308 to these vacuoles but cannot replicate therein, and c) the isogenic bacA mutant KL7 displays internalization and trafficking patterns in THP-1 cells that are different from those displayed by *B. abortus* 2308 or Hfq3.

DTIC

Vaccines; Infectious Diseases

20040008667 Hutchinson (Fred) Cancer Research Center, Seattle, WA, USA

The Prostate Expression Database (PEDB)

Nelson, Peter S.; Apr. 2003; 82 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0050

Report No.(s): AD-A418729; No Copyright; Avail: CASI; [A05](#), Hardcopy

This proposal aims to exploit advances in biotechnology and informatics to develop a genetics resource termed the Prostate Expression Database (PEDB) (<http://www.pedb.org>). The foundation of PEDB is the identification and characterization of a prostate transcriptome, the intermediary between the genome and the proteome that represents that portion of the human genome actively used or transcribed in the prostate. The research accomplished to date has assembled a working virtual prostate transcriptome that defines the genes used or transcribed in prostate cell types and tissues. This transcriptome has a physical counterpart of >10,000 cDNAs arrayed in cDNA microarray format for large-scale expression studies. This transcriptome has been used as a foundation for studies of the prostate proteome, the working counterpart to the genome and transcriptome. Our results show that these approaches are complementary. Analysis of the virtual transcriptome of LNCaP cells has identified 15 new androgen-regulated genes to date. We have extended PEDB to include sequence analysis of the murine prostate and constructed a corresponding database, mPEDB to facilitate the dissemination of mouse prostate gene expression information. The resources generated by the accomplishments of the objectives have utility in identifying genetic alterations in human and mouse prostate carcinoma that can be exploited as diagnostic or therapeutic targets.

DTIC

Data Bases; Prostate Gland; Gene Expression; Transcription (Genetics)

20040008669 Boston Medical Center Corp., Boston, MA, USA

Genes Differentially Expressed at the Transition from Premalignancy to Carcinoma

Rosenberg, Carol L.; Jul. 2003; 11 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0159

Report No.(s): AD-A418732; No Copyright; Avail: CASI; [A03](#), Hardcopy

The objective of this project is to identify genetic differences existing between atypical ductal hyperplasia (ADH), which are premalignant cancer precursor lesions, and ductal carcinoma in situ (DCIS), the earliest recognized human breast malignancy. We hypothesize that investigation of these differences should identify genes whose dysregulation is important to

the transition to malignancy. To achieve this objective, the project's first aim is to optimize techniques to preserve mammary glands, cut and stain sections, identify and microdissect areas of interest (i.e, hyperplasia and cancer), extract RNA and assess its quantity and quality.

DTIC

Genes; Carcinogens; Genetics; Cancer

20040008826 Coriell Inst. for Medical Research, Camden, NJ, USA

Epidermal Growth Factor (EGF) Receptor Intron 1 CA Repeat Polymorphisms in African-American and Caucasian Males: Influence on Prostate Cancer Risk or Disease Progression and Interaction with Androgen Receptor CAG Repeat Polymorphisms

Moscatello, David K.; Sep. 2003; 38 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0080

Report No.(s): AD-A418677; No Copyright; Avail: CASI; [A03](#), Hardcopy

We are investigating the effect of polymorphic epidermal growth factor receptor (EGFR) gene intron 1 CA repeat on prostate cancer (Cap) development, alone or in combination with a known androgen receptor gene CAG repeat polymorphism. We will determine the lengths of these repeats in DNA from African-American and Caucasian men with CaP. The data will be analyzed for nay correlation using both parameters with clinical outcome (age of onset, rapid progression, or metastasis). A biostatistician has been recruited to the study and a new statistical analysis plan has been developed. The implementation' of the new HIPAA regulations by the Cooper Hospital/University Medical Center Institutional Review Board this year has resulted in additional delays in obtaining documentation required for the revised human subjects protocol. Thus, the Human Subjects Protocol has not yet been approved by the US Army Medical Research and Materiel Command Human Subjects Research Review Board (USAMRMC HSRRB). Since we have not been given%approval to initiate the study, there is no data to report. However, the current Human Subjects Protection Scientist at the DOD HSRRB has given verbal assurance that the HIPAA documentation was the last piece need for approval of the protocol, and we anticipate initiating the project very shortly.

DTIC

Prostate Gland; Cancer

20040010373 Colorado Univ., Boulder, CO

Selection of Aptamers for CED-9/Bcl-2 Family Cell Death Regulators and Their Application in Study of Apoptosis Regulation and Drug Design for Breast Cancer

Xue, Ding; Jul. 2003; 13 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0214

Report No.(s): AD-A418718; No Copyright; Avail: CASI; [A03](#), Hardcopy

Programmed cell death (apoptosis) plays an essential role in maintaining the physiological balance of appropriate cell numbers by opposing uncontrolled cell proliferation. The pathway of programmed cell death appears to be highly conserved from C. elegans to humans, suggesting that studies of programmed cell death in C. elegans can provide important information for understanding how cell death is regulated and executed in humans. Moreover, novel means developed in C. elegans to modulate programmed cell death may also be applied to humans for better detection, prevention as well as treatment of human diseases caused by abnormal apoptosis (e.g. cancer, autoimmune disorders, and neurodegenerative diseases). In this study, we are employing the technique of SELEX (Systematic evolution of ligands by exponential amplification) to identify small RNA aptamers with high binding specificity and affinity for key cell death regulators, including CED-9 and CED-4 from C. elegans and Bcl-2 and Bcl-xL from humans. We hope to use these RNA aptamers to probe how Bcl-2 family proteins regulate programmed cell death in both C. elegans and mammalian cells. Importantly, if these RNA aptamers can be used to modulate apoptosis in C. elegans or mammalian cells, they may provide important insights into devising new diagnostic and therapeutic drugs to treat cancer and various apoptosis-related diseases. So far, we have successfully obtained RNA aptamers that bind CED-9 with Kds of approximately 10 nM. This high binding affinity will allow us to further study the effects of these aptamers in regulating apoptosis using both in vitro and in vivo assays: We have also conducted several rounds of SELEX experiments on CED-4 and Bcl-xL and have obtained candidate molecules with increasing binding affinity in vitro to these two proteins.

DTIC

Apoptosis; Cancer

20040010375 Baltimore Univ., MD, USA

Fibrinolysis in Tumor Associated Angiogenesis

McLeskey, Sandra W.; Jul. 2003; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAM17-01-1-0311

Report No.(s): AD-A418724; No Copyright; Avail: CASI; [A02](#), Hardcopy

Angiogenesis has been shown to be necessary for tumor growth and metastasis but specific targets for antiangiogenic therapy in breast cancer have not been identified. Patient samples, a tissue assay of angiogenesis with a mammary vessel explant, and xenograft breast tumors growing in mice will be used to investigate the role(s) of the plasminogen activator/inhibitor/receptor family of proteins in breast cancer angiogenesis. In the second year, we have developed a method for identifying endothelial cells growing in culture of a mammary vessel explant that utilizes ¹²⁵I- labeled acetylated LDL uptake. This method identifies the endothelial cells with a red fluorescence and enables observation of living mammary vessel cultures. Construction of retroviral vectors to infect these culture and host mouse tissues with antisense to plasminogen activator/ inhibitor/receptor cDNA is underway. Also under construction viral vectors for proteins of interest coupled to green fluorescent protein. Infection of mammary vessel cultures with these viral vectors will yield information on the localization of the labeled proteins and their function in invasion of the matrix and formation of endothelial tubes. Over the next year, we will be using these vectors to study the function of the plasminogen activator/inhibitor/ receptor system in the mammary vessel assay and in xenograft tumors in mice.

DTIC

Neoplasms; Metastasis

20040010376 Cold Spring Harbor Lab., New York, NY, USA

Analysis of Apaf-1 and Caspase 9 in Tumorigenesis

Narita, Masashi; Lowe, Scott W.; Jul. 2003; 34 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0209

Report No.(s): AD-A418725; No Copyright; Avail: CASI; [A03](#), Hardcopy

The final goal of our project is to elucidate the apoptotic and cellular senescence mechanisms of tumor suppression in breast cancer. p53 is clearly involved in both apoptosis and senescence, which has led to our emphasis on the p53 pathway. Although the initial approach was a genetical study of the p53-dependent apoptosis pathway, we shifted the focus of study to cellular senescence program, based on our findings of the senescence associated heterochromatic foci (SAHFs). We further characterized SAHFs and found that SAHF- formation is dependent on the p16/Rb pathway using stable retroviral RNAi system. We also found that E2F-targets, which are required for cell cycle progression and regulated by the Rb-family, are stably silenced in senescence. We propose that E2F-targets are heterochromatinized possibly by being involved in SAHFs, resulting in the irreversible cell cycle arrest in senescence.

DTIC

Apoptosis; Cancer; Aging (Biology)

20040010377 Washington Univ., Seattle, WA

MCAK and Stathmin Upregulation in Breast Cancer Cells: Etiology and Response to Pharmacologic Reagents

Wordeman, Linda G.; Jul. 2003; 102 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0450

Report No.(s): AD-A418727; No Copyright; Avail: CASI; [A06](#), Hardcopy

The goal of this study is to assay the role that two modulators of microtubule dynamics, Mitotic centromere- associated Kinesin (MCAK) and Op18/ stathmin (stathmin) play in the development of cancer. These proteins are elevated in aggressive breast cancer tumors and changes in the levels and activity of these proteins have been correlated with alterations in chromosome number and cell motility and invasiveness. In addition to our previously discovered C- terminal regulation, we have uncovered another major regulatory mechanism to control microtubule dynamics through MCAK activity. Phosphorylation of conserved serine residue in the neck and N-terminus of MCAK by Aurora B kinase inhibits its activity. It is likely that phosphorylation and dephosphorylation controls MCAK's activity during mitosis and also, via other kinases, during interphase. We have also identified two other Kin I kinesins which regulate microtubule dynamics in cultured cells and are likely to be regulated by kinases and phosphatases. These regulatory kinases also control stathmin activity in cells. Regulation of these proteins via cascades of kinase and phosphatase activities opens up a major new area for the application of therapeutics to control microtubule dynamics and augment existing cancer therapies that target microtubules.

DTIC

Cancer; Mitosis; Enzyme Activity; Chromosomes

20040010378 California Univ., San Diego, La Jolla, CA

The Role of N-CoR During Normal Mammary Gland Development

Ju, Bong-Gun; Rosenfeld, Michael G.; Aug. 2003; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0184

Report No.(s): AD-A418738; No Copyright; Avail: CASI; [A03](#), Hardcopy

Understanding the regulation of N-CoR and its associated corepressors, in concert with defining the molecular mechanisms that underlie regulation by estrogen- receptor, offers a reasonable prospect of achieving new approaches to diagnosis and treatment of breast cancer. Here, we demonstrated that estrogen receptor recruits at least two distinct N-CoR-containing complexes as mSin3/HDAC 2/1 and also the novel TAB2/HDAC3/N-CoR complex that bind to antagonist. Also, we identification of a novel N-CoR complex containing a factor TAB2 and HDAC3 as a nuclear repressor complex. The inflammatory signals such as IL- 1b causes export of the TAB2/N-CoR/HDAC3 complex from nucleus to cytoplasm by MEKK1 action. Furthermore, our results revealed that a specific complex such as TBL1/ TBLR1 is required for activation of ER(alpha), based on its function in antagonizing N-CoR/SMRT by ubiquitin ligase mediated exchange for transcriptional activation. Among the N-CoR corepressor target genes, c-myc and KA1 plays important roles in the cell cycle control and metastases during breast cancer. In this report, we suggested that N-CoR is linked to Beta-catenin signaling pathway and N-CoR/TAB2 might be involved in the regulation of the expression of an important metastasis suppressor gene.

DTIC

Mammary Glands; Estrogens; Cancer

20040010380 Southern Research Inst., Birmingham, AL

Novel Inhibitors of FGF Signal Transduction in Breast Cancer: Targeting the FGFR Adapter Protein SNT-1

Kern, Francis G.; Manuvakhova, Marina S.; Li, Rongbao; Mar. 2003; 34 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0434

Report No.(s): AD-A418741; No Copyright; Avail: CASI; [A03](#), Hardcopy

FGF stimulation leads to tyrosine phosphorylation of the protein SNT-1, which binds to activated FGF receptors. The objective of this work was to determine if SNT-1 protein had a central role in transducing the signals that lead to FGF-mediated antiestrogen resistant growth. We expressed an SNT-1 PTB domain in MCF-7 cells using a modified tetracycline inducible expression system. Upon induction of the PTB domain, we observed a significant decrease of FGF-dependent tyrosine phosphorylation of wild type SNT-1, strong inhibition of complex formation between SNT-1, Gab-1 and Sos-1, blocked activation of Ras as well as phosphorylation of MAP kinase indicating that the SNT-1 PTB domain was functioning in a dominant negative manner. Under the same conditions we did not observe a decrease in phosphorylation of AKT and Thr 389 of p70S6K, components of PI-3 kinase pathway. FGF dependent colony formation of MCF-7 cells in media containing the antiestrogen ICI 182,780 was inhibited upon induction of SNT-1 PTB domain. We conclude that SNT-1 plays a major role in the FGF-dependent activation of Ras/MAPK pathway and proliferation of MCF-7 cells and that overexpression of SNT-1 PTB domain can block these responses. We also suggest some SNT-1 independent mechanisms of PI-3K activation by FGF.

DTIC

Tetracyclines; Phosphorylation

20040010382 Yale Univ., New Haven, CT

P53 Regulation of Uridine Phosphorylase Activity, Pyrimidine Salvage Pathway and Their Effects on Breast Cancer Therapy

Cao, Deliang; Pizzorno, Giuseppe; Jul. 2003; 47 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0508

Report No.(s): AD-A418743; No Copyright; Avail: CASI; [A03](#), Hardcopy

This research project has been focused on the elucidation of the mechanisms affecting the therapeutic efficacy of fluoropyrimidines to improve the clinical outcome of breast cancer patients. Based on the findings of the last scientific year that the nullification in ES cells of uridine phosphorylase (UPase) leads to a significantly increased cell resistance to fluoropyrimidines and that wild-type p53 protein down-regulates UPase expression, we have focused our research on the following two areas: 1) Elucidation of the p53 regulation mechanism(s) of UPase expression; In this investigation, we demonstrated that wild-type p53 protein represses UPase gene expression via sequence-specific DNA binding at promoter level, and that the mutations of p53 leads to loss of this regulatory function. 2) In vivo study of UPase function in fluoropyrimidine metabolism and uridine regulation. In order to better translate the basic research understanding to the clinical service, we have extended our first year's findings on UPase knockout ES cell to in vivo study through generation and use

of UPase knockout mouse model. The research results defined the important role in vivo of UPase in fluoropyrimidine metabolism and uridine regulation in plasma and tissue.

DTIC

Cancer; Gene Expression; Nucleosides

20040010385 Albert Einstein Coll. of Medicine, Bronx, NY

Novel Lishmania and Malaria Potassium Channels: Candidate Therapeutic Targets

McDonald, Thomas; Kim, Kami; Apr. 2003; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0209

Report No.(s): AD-A418746; No Copyright; Avail: CASI; [A03](#), Hardcopy

The purpose of this research project is to characterize the newly identified potassium channel genes from *Plasmodium falciparum* and determine if they may be exploited as chemotherapeutic targets. The research plan, included: complete cloning of two *P. falciparum* K⁺ channels; subcloning of channel genes for expression and epitope tagging; expression of the channel genes for biophysical, pharmacological and biochemical analyses; generation of specific antibodies to channel proteins for analysis of channels in vivo; and pharmacological analysis of specific K⁺ channel blockers as anti-malaria agents. In the first year of this project we have made considerable progress in reaching these goals. We have completed the cloning and subcloning of both K⁺ channel genes from *P. falciparum*, PFK1 and PFK2. We have expressed both genes and identified protein products in bacterial and mammalian heterologous expression systems. We have generated specific antibodies using recombinant proteins as antigens. These antibodies recognize the appropriate proteins by Western blot analysis. We have screened a panel of K⁺ channel blockers and have consistent data on their anti-malarial activity. We are encouraged by the progress this year and are confident of further success and reaching our stated goals as we continue with this project.

DTIC

Genes; Biochemistry; Parasitic Diseases

20040010387 Hawaii Univ., Honolulu, HI

UH - USA Agreement - A Telemedicine Research Proposal

Burgess, Lawrence P.; Jan. 2003; 311 pp.; In English

Contract(s)/Grant(s): DAMD17-99-2-9003

Report No.(s): AD-A418747; No Copyright; Avail: CASI; [A14](#), Hardcopy

The purpose of the University of Hawaii Telemedicine Curriculum Research Project is to develop an effective web-based curriculum for training military health care personnel in the use of contemporary communication, automation, and informatics technology in the delivery of health care. The overall curriculum is generic in nature, while specific modules can be tailored to the needs of the military health care provider (HPC). The goal of the telemedicine curriculum is to impart both the necessary knowledge and practice skills to the HPC. The HPC will learn the various clinical uses of telemedicine and will also understand the clinical and organizational barriers of the successful utilization of telemedicine. The telemedicine curriculum has been designed to address the communication and automation tools available to the military health care system. This advanced toolkit of telemedicine curriculum modules will support the efforts of the DoD to efficiently and effectively apply the latest technological advances in communication and data transfer to improving health care delivery.

DTIC

Telemedicine; Health

20040010388 Minnesota Univ., Minneapolis, MN

Image-Guided Surgery of Primary Breast Cancer Using Ultrasound Phased Arrays

Ebbini, Emad S.; Jul. 2003; 48 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0330

Report No.(s): AD-A418748; No Copyright; Avail: CASI; [A03](#), Hardcopy

Recent developments of piezocomposite transducer technology have lead to the development of new generation of ultrasound phased arrays with imaging and therapeutic capabilities. These dual-mode arrays provide an ideal nonionizing noninvasive tool for the treatment of primary breast cancer. This project investigates the thresholds for tissue damage under a variety of exposure conditions to high-intensity focused ultrasound from dual-mode arrays. In addition, we investigate new imaging techniques for enhanced visualization of thermal lesions in tissue media. These investigations are carried on ex-vivo animal tissue and in-vitro breast tissue and will lead to the design of a new generation of phased array drivers capable of supporting both the imaging and therapeutic requirements of the dual-mode system. During the second year of the grant, we

have focused on the complete characterization of the imaging capabilities of the dual-mode array prototype for visualization of lesions in ex vivo tissue. We have also compared these imaging results with those obtained using a commercially available diagnostic scanner. The results validated the dual-mode array approach and allowed us to finalize the design of the real-time data collection and beamforming algorithm. We are on track towards implementing a real-time dual-mode system suitable for in vivo animal experiments.

DTIC

Phased Arrays; Beamforming

20040010392 Notre Dame Univ., IN

Molecular Mechanisms of Metastatic Progression in Breast Cancer

Flanagan, Louise A.; Jul. 2003; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0527

Report No.(s): AD-A418756; No Copyright; Avail: CASI; [A03](#), Hardcopy

Clusterin is a multifunctional disulphide linked protein that is induced during regression of hormone dependent tissues. of particular interest to us is the observation that clusterin expression is confined to surviving cells following induction of cell death, suggesting that it may be involved in cell survival rather than cell death. Clusterin expression has also been correlated with tumor grade and resistance to cytotoxic compounds such as TNF-alpha in prostate cancer. In our studies we have focused on determining whether clusterin plays a causative role in the progression of human breast carcinoma by promoting cell survival, increasing cell motility and resistance to cytotoxic drugs. Our studies have utilized an ER-alpha positive non-invasive MCF-7 cell line, an MCF-7 cell line genetically engineered to overexpress clusterin (MCF-7CLU) and an ER-alpha negative invasive SUM-159PT cell line. Our major finding to date are that SUM-159PT and MCF-7CLU cells secrete 5-10 times more clusterin than MCF-7 cells. Both SUM-159PT and MCF-7CLU cells display resistance to TNF-alpha in comparison to the highly sensitive MCF-7 cells. Furthermore, our in vitro invasion assays demonstrate a dramatic increase (10 fold) in the invasive potential of the MCF-7CLU cells as compared to the parental non-invasive MCF-7 cells. Our data clearly demonstrate a role for clusterin in breast tumor promotion and resistance to possible therapeutic compounds. In vivo studies currently underway are focusing on tumor growth and progression in the MCF-7 vs MCF-7CLU cell lines, followed by measuring sensitivity to the most commonly used clinical antiestrogen tamoxifen.

DTIC

Mammary Glands; Metastasis

20040010397 Naval Health Research Center, San Diego, CA

Predictors of Navy Attrition. II. A Demonstration of Potential Usefulness for Screening

Larson, Gerald E.; Booth-Kewley, Stephanie; Ryan, Margaret A.; Jan. 2001; 9 pp.; In English

Report No.(s): AD-A419053; NHRC-01-06; No Copyright; Avail: CASI; [A02](#), Hardcopy

The Sailors Health Inventory Program (SHIP) questionnaire is a medical and psychosocial history questionnaire completed by all Navy recruits. This study was an investigation of the potential usefulness of the SHIP questionnaire for screening to reduce basic training attrition. The sample consisted of 66,690 Navy recruits. Although the most valid individual SHIP items for predicting attrition tended to be psychological or behavioral in nature, a composite of 40 diverse SHIP questions (including medical questions) was found to be the best overall attrition predictor. Further analyses revealed that the 40-item composite is a considerably more powerful attrition predictor than is either educational credential or mental ability score, which together are currently the U.S. military's primary attrition management tools. Finally, the consequences of using different cutoff scores on the 40-item composite were simulated, so that various hypothetical screening strategies can be considered.

DTIC

Predictions; Health; Mental Performance

20040010400 Baylor Coll. of Medicine, Houston, TX

Dietary Methionine Restriction: Novel Treatment for Hormone Independent Prostate Cancer

Epner, Daniel E.; May 2003; 45 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0019

Report No.(s): AD-A419057; No Copyright; Avail: CASI; [A03](#), Hardcopy

Many studies have shown that methionine restriction inhibits growth of a variety of human tumor xenografts, including prostate cancers. In contrast, methionine restriction is relatively well tolerated by normal host tissues. The overall goal of the

current project is to clarify the molecular mechanisms by which methionine restriction inhibits tumor growth. During the second year of support, we focused on Specific Aim 3, which is to determine whether methionine restriction leads to DNA demethylation in cancer cells. We used Southern blot analysis with methylation-sensitive restriction enzymes, western blot analysis, and RT-PCR to determine whether methionine restriction restored expression of growth inhibitory genes known to be transcriptionally silenced in cancer cells. We studied human prostate, colon, bladder, and leukemia cell lines. Treatment with the demethylating drug 5-azacytidine was used as a positive control for DNA demethylation. We found that methionine restriction did not lead to DNA demethylation or re-expression of the genes studied. These results are consistent with published studies showing that DNA demethylation requires cell division, which rapidly ceases in response to methionine restriction. Future studies will focus on the possible role of methionine restriction in regulation of other critical methyl acceptors, such as RNA and protein.

DTIC

Cancer; Cell Division; Acceptor Materials

20040010585 Pennsylvania State Univ., University Park, PA, USA

Astrobiology: The Search for Life in the Universe

Pacchioli, David; Space Science Reference Guide, 2nd Edition; [2003]; 16 pp.; In English; Astrobiology: Looking for Life in the Universe, 22 Jan. - 26 Feb. 2000, University Park, PA, USA; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Each of the 11 lead members of NASA's Astrobiology Institute has a specific mission. According to Hiroshi Ohmoto, director of Penn State's Astrobiology Research Center, Here we are mainly concerned with the origin of life and the evolution and extinction of important organisms. These include bacteria that live on methane, cyanobacteria (the inventors of photosynthesis), eukaryotes (a big category, covering anything with a nucleus, from single-celled organisms to humans), land-dwelling organisms, and early animals. Penn State astrobiologists are studying the environment before there was life on Earth, the origin of oxygen in the atmosphere, the chemical and thermal structures of oceans, and the role of metals in the evolution of life. Overall, they want to understand the connection between changes in environment and changes in life forms in the early Earth. PSARC offers research assistantships for graduate and undergraduate students, fellowships for graduate students and post-doctoral fellows, and an undergraduate minor in astrobiology. The minor covers 18 credits in earth sciences, geochemistry, geophysics, astronomy, biology, biochemistry, meteorology, and microbiology. The goal, says Ohmoto, is to teach students to critically evaluate claims related to this field that they encounter well after their college education has ended. Under a scanning electron microscope, Martian meteorite ALH84001 yields tube-like structures that look a lot like remnants of Earthly bacteria except smaller by a factor of ten.

Derived from text

Biological Evolution; Geophysics; Exobiology; Chemical Composition; Earth Sciences; Biochemistry

20040010622 Jackson Lab., Bar Harbor, ME

Recombinational Repair Genes and Breast Cancer Risk

Shima, Naoko; Jul. 2003; 31 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0277

Report No.(s): AD-A418792; No Copyright; Avail: CASI; [A03](#), Hardcopy

It was hypothesized in my proposal that DNA double strand break (DSB) repair could be one of the most important factors in breast tumor suppression, considering functions of BRCA1 and BRCA2 in DSB repair by homologous recombination (1). In addition, elevated radiosensitivity of lymphocytes from unselected breast cancer patients has been reported (2), implicating that individual difference in DSB repair may contribute to breast cancer susceptibility. DSB repair in mammals is not well understood, so there might be some unidentified genes which may influence breast cancer risk. I have chosen forward genetics approaches such as phenotype-driven mutagenesis to identify such new genes and to investigate their biological roles in the context of a whole organism.

DTIC

Cancer; Deoxyribonucleic Acid; Genes; Mammary Glands; Recombination Reactions

20040010637 Columbia Univ., New York, NY

Association Between Offspring's hCG Genotype and Breast Cancer Risk in Mothers: A Novel Approach

Ahsan, Habibul; Jun. 2003; 5 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0354

Report No.(s): AD-A418789; No Copyright; Avail: CASI; [A01](#), Hardcopy

We proposed to examine the novel hypothesis that the hCG genotype of a woman's offspring is associated with her breast cancer risk. Using the existing Metropolitan New York Registry (MNYR) resources, a case-control study was designed to examine the hypothesis whether first-born offspring's hCGbeta 5 genotype (i.e., placental hCGP 5 genotype during first FTP) is associated with a woman's breast cancer risk. To date, the three tasks in the approved Statement of Work for year 1 have been accomplished.

DTIC

Hypotheses; Mammary Glands; Cancer

20040010638 Howard Univ., Washington, DC

A Training Program in Breast Cancer Research Using NMR Techniques

Wang, Paul C.; Jul. 2003; 26 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0291

Report No.(s): AD-A418790; No Copyright; Avail: CASI; [A03](#), Hardcopy

In the third year, this program has supported three graduate students (one from Electrical Engineering Department, one from Biochemistry Department, and one medical student) and two postdoctoral fellows (Radiology Department). The new medical student has been introduced to the Biomedical NMR Laboratory and the Howard University Cancer Center. The trainees have continued to learn the theory and instrumentation of nuclear magnetic resonance imaging and spectroscopy. The trainees have rotated through the mammography service in the Department of Radiology in the hospital to learn the mammography procedures. Besides attending weekly seminars in the Cancer Center, the trainees also have attended a special seminar series on breast imaging sponsored by this grant and the Department of Electrical Engineering. Each trainee has actively participated in one of the two research projects. Based on the experimental findings, two papers were published. Two posters have been presented in the national scientific meetings. Two graduate student trainees have received their MD or PhD degree. One graduate student received a postdoctoral award from the Army Medical Command and she will continue working as a postdoc in the Cancer Center. The PI has received a RSNA medical student departmental grant.

DTIC

Nuclear Magnetic Resonance; Students; Medical Science; Mammary Glands; Cancer

20040010639 California Univ., Riverside, CA

Administration of Additional Phosphorylated Prolactin During Pregnancy Inhibits Mammary Ductal Branching and Promotes Premare Lobuloalveolus Development

Walker, Ameae M.; Jul. 2003; 103 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0180

Report No.(s): AD-A418802; No Copyright; Avail: CASI; [A06](#), Hardcopy

Prolactin (PRL) is a hormone recognized as promoting both proliferation and differentiation in the mammary gland. Current theory proposes that it is the coexisting steroidal environment that dictates which of these two activities predominates. During the tenure of this grant, however, we have determined that the ratio of unmodified PRL (U-PRL) to phosphorylated PRL (as judged by the use of a molecular mimic, S179D PRL) is also important in this regard. Working directly on the mammary gland, U-PRL promotes proliferation, whereas S179D PRL inhibits proliferation and yet promotes differentiation.

DTIC

Proteins; Mammary Glands; Cancer

20040010640 Pennsylvania Univ., Philadelphia, PA

Identifying and Reaching Populations at Risk: The Paradox of Breast Cancer Control

Armstrong, Katrina A.; Jul. 2003; 70 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0596

Report No.(s): AD-A418783; No Copyright; Avail: CASI; [A04](#), Hardcopy

This project aimed to examine the shifting demographics of the medically underserved and identify newly evolving sociocultural factors that might act as barriers to care. Understanding these factors and making recommendations for their culturally sensitive removal will help improve patient compliance. We used a qualitative, semi-structured interview methodology to document the shifting social, cultural and associated logistical barriers to breast cancer screening; to gain insight into the underlying logic supporting these barriers; and understand how these logics, and hence barriers, are perpetuated. We uncovered a potential cultural model of health maintenance and prevention among African American women that may negatively impact breast cancer prevention delivery. The results of this project have formed the foundation of a

research program to validate our findings and evaluate the potential impact of this cultural model of prevention on chemoprevention uptake among African American women.

DTIC

Cancer; Mammary Glands

20040010645 Brigham and Women's Hospital, Boston, MA

Training Grant in Epidemiology and Prevention of Breast Cancer

Colditz, Graham A.; Jul. 2003; 46 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0165

Report No.(s): AD-A418817; No Copyright; Avail: CASI; [A03](#), Hardcopy

We propose a training grant to recruit and train two postdoctoral students and three physicians. These trainees will acquire skills in the epidemiology and prevention of breast cancer. They will work closely with mentors who have a long track record of training epidemiologists. The funding will allow our research group to focus specific training opportunities on breast cancer. The ongoing epidemiologic studies and prevention trials offer a unique resource in which trainees can participate in cutting edge research and acquire skills that will establish them as future leaders. We have to date enrolled three doctoral students: Heather Baer, Heather Eliassen and Jeanne Marie Gaare-Eby; and three physicians: Ann Partridge, M.D. received her M.P.H. and is working as a clinician and a breast cancer researcher; Larissa Nekhlyadov, M.D., M.P.H., this past year, has been pursuing several research projects in breast cancer prevention and early detection; and Candice Aitken, M.D., a resident in radiation oncology will pursue her M.P.H., and has an interest in cancer prevention, and identification of risk factors for educational models. As a result of this award, we have also established the Advanced Cancer Epidemiology Seminar in Breast Cancer each spring in which all trainees participate.

DTIC

Cancer; Mammary Glands; Epidemiology

20040010646 Minnesota Univ., Minneapolis, MN

Cell Cycle Dependent Regulation of Human Progesterone in Breast Cancer

Mullany, Lisa K.; May 2003; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0495

Report No.(s): AD-A418821; No Copyright; Avail: CASI; [A02](#), Hardcopy

Breast cancers are often characterized by increased growth factor signaling pathways and numerous cell cycle alterations. PR are phosphorylated by CDK2 in vitro and in vivo at multiple sites including serine 400 (Ser400). The purpose of these studies is to investigate the role that growth factors and cell cycle molecules play on the regulation of PR by phosphorylation of Ser400. Treatment of T47D breast cancer cells with mitogens increased the phosphorylation of PR ser400, as did the synthetic progestin R5020. Progestin dependent phosphorylation of Ser400 was reversed by a CDK2 inhibitor. Overexpression of cyclin E and CDK2 resulted in downregulation of PR protein in the absence of ligand. This effect was blocked by a CDK2 inhibitor. P27 is a cyclin- dependent kinase inhibitory protein. A p27^{-/-}-cell line was used to measure the transcriptional activity of PR following transient co-transfection of PR and a progesterone responsive- element Ligand-independent PR transcriptional activity was elevated in p27^{-/-}-cells; mutation of PR serine 400 to alanine resulted in loss of PR transcriptional activity. In' addition, cyclin E and CDK2 associated with wt PR in co- immunoprecipitation experiments. Regulation of PR by altered cyclin/CDKs may confer a selective advantage to breast cancer cells.

DTIC

Cancer; Mammary Glands; Phosphorylation

20040010653 Baylor Coll. of Medicine, Houston, TX

Role of Nuclear Receptor Coactivators, AIB-1 and SRC-1, in the Development of Breast Cancer

Tsai, Sophia Y.; Apr. 2003; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9077

Report No.(s): AD-A418666; No Copyright; Avail: CASI; [A03](#), Hardcopy

Steroid hormones are involved in the development and growth of breast cancer. Drugs, which inhibit estrogen action, are commonly used to inhibit breast cancer growth. Unfortunately, most advanced breast cancer becomes resistant to estrogen treatment. Recently, many steroid receptor coactivators have been discovered and found to potentiate the transcriptional activity of steroid receptors and enhance the expression of hormone response genes. In the SRC-1 family of coactivators, AIB1 is found amplified and/or over-expressed in breast cancer specimens. To evaluate the potential roles of the SRC-1 family of

coactivators in mammary tumorigenesis in vivo, we proposed to generate transgenic mice over-expression of AIB1 (SRC-3) in mammary glands. To target the expression of AIB1 in mammary gland, we placed the AIB1 transgene under the control of the MMTV-LTP promoter. Two lines of transgenic mice expressing AIB1 have been generated. Studies on these transgenic mice will help understand the development and progression of breast cancer and provide a molecular basis for designing novel strategies to curb and, ultimately, cure breast cancer.

DTIC

Mammary Glands; Cancer; Hormones; Receptors (Physiology)

20040010654 Duke Univ., Durham, NC

The Role of GADD34 (Growth Arrest and DNA Damage- Inducible Protein) in Regulating Apoptosis, Proliferation, and Protein Synthesis in Human Breast Cancer Cells

Weiser, Douglas C.; Jul. 2003; 18 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0378

Report No.(s): AD-A418759; No Copyright; Avail: CASI; [A03](#), Hardcopy

GADD34 is a stress-induced proteins implicated in the control of protein synthesis and apoptosis. It is a major target of the oncogene c-myc. Myc is widely implicated in breast cancer and potently inhibits GADD34 expression. The goal of this proposal is to better understand the mechanism of GADD34 induced apoptosis and the implications of this to human breast cancer. Toward this goal we have analyzed the regulation of eIF2 alpha dephosphorylation by GADD34 and by its binding partner Inhibitor-i. We have demonstrated that proper subcellular localization of GADD34 is necessary for function. We have identified a novel domain that targets GADD34 to the endoplasmic reticulum, and a domain involved in PPI binding. Finally, we also examined the role of I-, 1 a CADD34 interacting protein that inhibits PPI, in inhibiting eIF2 alpha dephosphorylation and identified a novel domain necessary for in vivo function of 1-1.

DTIC

Apoptosis; Mammary Glands; Cancer; Deoxyribonucleic Acid

20040010655 Rice Univ., Houston, TX

Investigations of Thaxtomin Biosynthesis

Parry, Ronald J.; Dec. 2003; 4 pp.; In English

Contract(s)/Grant(s): N00014-02-1-1005

Report No.(s): AD-A418760; No Copyright; Avail: CASI; [A01](#), Hardcopy

The thaxtomins are dipeptide phytotoxins produced by Streptomyces acidoscabies and related species. A novel feature of these compounds - is the presence of a 4- nitrotryptophan moiety. The thaxtomin gene cluster contains two peptide synthetase genes (txtA; txtB), two cytochrome P450 genes, and a nitric oxide synthase (NOS) gene. The NOS gene is hypothesized to play a role in the formation of 4- nitrotryptophan. Both the mechanism and the timing of the nitration reaction are currently unknown. To determine the timing of the nitration reaction, we cloned the adenylation domains of txtA and txtB, and showed that the proteins can-be overproduced in soluble form in E. coli. This should allow the substrate specificity of these adenylation proteins to be determined in future studies. We also used the NOS gene from the thaxtomin gene cluster to probe several species of Streptomyces that produce metabolites whose biosynthesis might involve a NOS. These investigations led to the cloning of a NOS gene from S. alanosinicus, which produces the antitumor agent L-alanosine. A transformation system was then developed for S. alanosinicus and the NOS gene was disrupted by single crossover insertion. The effect of NOS gene disruption on L- alanosine production is currently under investigation.

DTIC

Biosynthesis; Enzyme Activity; Nitration

20040010714 Texas Univ., Galveston, TX, USA

Novel Drug Delivery Technique for Breast Cancer Therapy

Esenaliev, Rinat O.; Jul. 2003; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0416

Report No.(s): AD-A418735; No Copyright; Avail: CASI; [A03](#), Hardcopy

This report describes the progress achieved during the second year of the project. We proposed to complete Task 2 and begin to implement Task 3 in the second year of the project. Task 2 (a and b) focuses on in vivo studies of ultrasound-induced penetration of real anti-cancer drugs in human MCF-7 breast tumors of nude mice. Tasks 2a and 2b are devoted to in vivo studies of ultrasound-induced penetration of real anti cancer drugs: 5- FU and Interleukin-2, respectively, in the breast tumors.

We conducted these studies to implement the proposed tasks. Our data obtained with the use of histological evaluation of the tumors indicate that the ultrasound produces enhanced delivery of the anti-cancer drugs in the tumors. This results in dramatic tumor necrosis that was obtained when mice were injected with the anti-cancer drug (5-PU or Interleukin-2) and the tumors were irradiated by ultrasound, while minor tumor necrosis was noticed when the drug was used without irradiation. At present, according to our research schedule, we are performing the studies proposed in the Task 3: to study efficacy of breast cancer therapy with the use of ultrasound-enhanced delivery of anti-cancer drug 5- PU.

DTIC

Chemotherapy; Drugs; Cancer

20040010719 Texas Univ. Health Science Center, San Antonio, TX, USA

Mechanisms for Controlling Breast Cancer Growth and Skeletal Metastasis

Ghosh-Choudhury, Nandini; Jun. 2003; 46 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9400

Report No.(s): AD-A418736; No Copyright; Avail: CASI; [A03](#), Hardcopy

The aim of this project was to understand the role and the mechanism of bone morphogenetic protein-2 (BMP-2, a protein mainly known to help in bone remodeling) in breast cancer cell growth and bone metastasis. To this end we have conclusively shown that BMP-2 is a potent inhibitor of breast cancer cell growth in a nude mouse xenograft model. We have also been successful in establishing an animal model to study bone metastasis from xenograft experiments. We have recently got data from our preliminary experiments to suggest that BMP- 2 has the potential to reduce osteolysis following breast cancer development in the nude mice model. For the past year during the no cost extension period of my project we tried to develop some new ideas related to our findings from this project. We looked at the mechanism of BMP-2 induced inhibition of breast cancer cell growth in the tumors formed in the presence of BMP-2. We also started to look into the role of dietary supplements to increase the growth inhibitory property of BMP-2 in this mouse model. The proposed experiments were include in a new DOD IDEA proposal this year and is pending review later this year. The preliminary experiments point to an interesting finding showing that fish oil supplement in diet of mice can effectively reduce breast cancer cell growth and BMP-2 might be involved in this mechanism.

DTIC

Metastasis; Cancer; Cell Division

20040010720 Medicine and Dentistry Univ. of New Jersey, Piscataway, NJ, USA

Collagenases in Breast Cancer Cell-Induced Metastatic Tumor Growth and Progression

Selvamurugan, Nagarajan; Jul. 2003; 18 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0656

Report No.(s): AD-A418739; No Copyright; Avail: CASI; [A03](#), Hardcopy

Since collagenases (-1 and -3) degrade the extracellular bone matrix (ECM) components, collagenase-driven ECM proteolysis may facilitate cancer growth and progression. To test this hypothesis, we made a transgene construct containing collagenase-1 cDNA under the control of the bone specific osteocalcin promoter. The application of a transgenic mouse model will contribute greatly to the understanding of the pathogenesis of bone metastasis. Transforming growth factor (TGF)-Beta1 is a crucial molecule in metastatic breast cancer. It can potentially disrupt the normal balance between osteoclast- and osteoblast-derived matrix metalloproteinase (MMP) activity within bone by inducing. the expression of MMPs and their inhibitors from bone-metastasizing cancer cells. TGF- Beta1 stimulates collagenase-3 expression in human breast cancer cells (metastatic in nature) . An intensive drug discovery program led to many clinical trials of MMP inhibitors for cancer therapy. However, these trials have largely been disappointing. A greater Understanding of the regulatory mechanisms that control MMP transcription, activation and inhibition will provide several new avenues for therapeutic intervention. Here, we dissected the signaling and molecular mechanisms responsible for TGF-Beta1 stimulated collagenase-3 expression in human breast cancer cells.

DTIC

Bones; Metastasis; Bone Mineral Content

20040010726 Connecticut Univ., Farmington, CT, USA

Study of RANKL Expression in Metastatic Breast Carcinoma

Bhatia, Pardeep; Jun. 2003; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0510

Report No.(s): AD-A418749; No Copyright; Avail: CASI; [A03](#), Hardcopy

Bone is the most common site of metastases by human breast cancer. Most breast cancers form osteolytic metastases, in contrast to tumors such as prostate cancer that form osteosclerotic metastases. Although some evidence suggests that formation of bone metastases by breast cancer cells is mediated by the increased osteoclastogenesis at the target site, a clear controversy exists whether formation of bone metastases is mediated by breast cancer cells directly or by stimulated osteoclasts. We have therefore examined the expression of RANKL, an important protein involved in the bone remodeling, in invasive carcinoma of breast and bone metastases. We observed that RANKL is present not only in non- neoplastic breast but also in Infiltrating Ductal Carcinoma (IDC). Further, breast cancer cells lose the expression of RANKL as they become metastatic to bone. Therefore the formation of osteolytic lesions in bone by breast cancer cells may not be due to direct interaction of tumor cells and bone. Rather a different mechanism might be operating. However, loss of RANKL expression in Bone metastasis might serve as an indicator of bone metastasis and RANKL might prove as a diagnostic or prognostic marker for breast cancer metastasis.

DTIC

Cells (Biology); Metastasis; Bones; Bone Demineralization

20040010728 Manitoba Univ., Winnipeg, Manitoba, Canada

The Role of S100A7/RANBPM Interaction in Human Breast Cancer

Emberley, Ethan D.; Watson, Peter; Aug. 2003; 51 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0320

Report No.(s): AD-A418754; No Copyright; Avail: CASI; [A04](#), Hardcopy

Psoriasin (S100A7) is expressed at low levels in normal breast epithelial cells but is highly expressed in preinvasive ductal carcinoma in situ. Persistent psoriasin expression occurs in some invasive carcinomas and is associated with poor prognostic factors. We have found that psoriasin physically interacts with Jab1 (c-jun activation- domain binding protein 1) in the yeast two-hybrid assay and confirmed this by coimmunoprecipitation assay in breast cancer cells. Psoriasin-transfected breast cancer cells showed increased nuclear Jab1 and demonstrated several features consistent with an alteration in Jab1 activity including an increase in activator protein-I (AP-1) activity, increased expression of AP-1 and HIF-1-dependent genes, and reduced expression of the cell-cycle inhibitor p27(sub KiPl). Psoriasin overexpression was also associated with alteration of cellular functions that are associated with increased malignancy, including increased growth, decreased adhesion, and increased invasiveness in vitro, as well as increased tumorigenicity in vivo in nude mice. We conclude that intracellular psoriasin influences breast cancer progression and that this may occur through stimulation of Jab 1 activity.

DTIC

Cytology; Adhesion; Genes; Cancer

20040010729 Pennsylvania State Univ., Hershey, PA, USA

Metastasis Genes in Breast Cancer Metastasis to Bone

Welch, Danny R.; Jun. 2003; 57 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0541

Report No.(s): AD-A418755; No Copyright; Avail: CASI; [A04](#), Hardcopy

The most prevalent site of breast cancer metastasis is bone. We will begin to elucidate the molecular mechanisms involved in bone metastasis. We propose to develop and utilize green (GFP) and/or red (dsRed) fluorescent protein- tagged breast carcinoma xenografts to measure bone metastasis following intracardiac injection. Cell lines developed will be used to test whether a metastasis suppressor (BRMS1) and a gene it down-regulates (osteopontin) alter the efficiency of bone colonization. Concomitantly, we will test the impact of changed gene expression on the ability of tumor cells to adhere to human osteoblast cell cultures or human bone marrow endothelium.

DTIC

Genes; Bone Marrow; Metastasis; Gene Expression

20040010732 Cold Spring Harbor Lab., New York, NY, USA

Genetic Requirements for the Transformation of Human Cells

Seger, Yvette M.; Jul. 2003; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418793; No Copyright; Avail: CASI; [A03](#), Hardcopy

Much of what we know about the details of neoplastic transformation comes from studies in cell culture. With the original demonstration by Weinberg, Wigler and Barbacid that cells could be transformed in vitro by DNA sequences from cancer cells, mouse cells have become premier models for the study of oncogene and tumor suppressor function. This has evolved in recent

years to the study of genetically defined mouse models (transgenics and knock-outs). These have provided a great deal of key information regarding the transformation process and have served as model systems in which to test new anti-cancer therapies. Despite the utility of the aforementioned approach, there is a fundamental problem with absolute reliance on this paradigm. Genetic alterations that easily transform rodent cells in culture do not have a similar effect on normal human cells. This implies a difference between the processes of neoplastic transformation in man and mice. In the face of intense scrutiny, the nature of this difference has remained a mystery for more than 30 years.

DTIC

Cells (Biology); Genetics; Oncogenes; Cancer; Mammary Glands

20040010733 Mount Sinai Medical Center, New York, NY, USA

Genetic Influences on Toxicity and Prognosis in Women Treated With Breast-Conserving Surgery and Radiation Therapy

Ambrosone, Christine B.; Aug. 2003; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0500

Report No.(s): AD-A418794; No Copyright; Avail: CASI; [A02](#), Hardcopy

Women with earlier stage breast cancer who receive breast conserving surgery and radiation therapy have a generally good prognosis. However, among 15-20% of these women, breast cancer recurs, and a similar proportion of women also experience severe toxicity with radiation therapy. It is possible that inter-individual differences in capabilities of both tumor and normal cells to protect themselves from radiation-induced damage, and to repair that damage if it does occur, will influence recurrence and toxicity. This variability common genetic polymorphisms. This study is conducted in a well-characterized cohort of women who had breast-conserving surgery followed by radiation therapy, and in whom skin reactions were measured and noted. We are extracting DNA from blood to determine genetic polymorphisms in a number of genes that may be important in response to treatment. By conducting follow-up on the women in the study, we will be able to determine how variability in genes that protect cells from damage and in those that repair DNA damage will affect both breast cancer recurrence and toxicity experienced. Follow-up is ongoing, through clinic visits, letters, and home visits, and in the next year, we will correlate genotyping results with toxicity.

DTIC

Females; Genetics; Mammary Glands; Prognosis; Radiation Therapy; Toxicity; Surgery

20040010734 Indiana Univ., Indianapolis, IN, USA

In Vivo Transcriptional Activation of Estrogen Receptor Target Genes: Differential Regulation in Mammary Gland Uterus and Bone

Jeng, Meei-Huey; Aug. 2002; 37 pp.; In English

Contract(s)/Grant(s): DAMD17-97-1-7066

Report No.(s): AD-A418796; No Copyright; Avail: CASI; [A03](#), Hardcopy

The purpose of this Career Development Award is to provide the salary support to foster the career development of the applicant and to study the Estrogen receptor (ER) target gene transcriptional activation in estrogen target organs. The scope of the research is to create an in vivo ER transactivation model to study the molecular mechanisms of estrogen, anti-estrogen, and growth factor action associated with ER target gene transcriptional activation in mammary gland, uterus, and bone. The major training accomplishment of this CDA is the promotions from non-tenure track Research Assistant Professor to tenure track Assistant Professor and then to Associate Professor, awards of RO1 and other research grants, invitation to chair symposia at international meetings, and invitation to various study sections. The applicant has established her own active research program in the area of breast cancer research because of the support from this CDA. The major research accomplishments include publications in major journals, presentations of data at international meetings, and several manuscripts in preparation. The major research findings include the successful establishment of an in vivo model of ER transactivation using adenovirus approach and the discovery of the segregation of steroid receptor coactivator-1 from ERα in normal mammary epithelial cells.

DTIC

Bones; Estrogens; Mammary Glands; Uterus; In Vivo Methods and Tests; Transcription (Genetics); Regulatory Mechanisms (Biology)

20040010738 Queens Univ., Kingston, Ontario, Canada

The Role of Fps in Tumor-Associated Angiogenesis

Sangrar, Waheed; Jul. 2003; 88 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0382

Report No.(s): AD-A418816; No Copyright; Avail: CASI; [A05](#), Hardcopy

The tyrosine kinase Fps has been implicated in angiogenesis. Expression of activated Fps - (MFps) causes hyper-vascularity in mice (fpsMF mice) suggesting that Fps may regulate angiogenesis. Studies have shown that the magnitude of vascularity is elevated 1.7-fold and is highly-disorganized and tortuous in nature. Stimulation of endothelial cells (EC) isolated from these mice has shown that MFps, but not Eps is activated in response to PDGF and VEGF. This suggests that MFps mediates hyper-sensitization of EC to these growth factors, an abnormality which may underlie the proangiogenic phenotype in these mice. In other studies we have shown early tumor onset in the context of loss-of-function Eps genetic backgrounds suggesting that Fps may behave as a tumor suppressor. Thus, Eps may be a suitable target for the development of anti-tumorigenic and anti-angiogenic therapeutics. Lastly, fpsMT mice may have a DIC-like phenotype. This was suggested by hemostatic defects and by an array of phenotypic features characteristic of disorders associated with vascular hyperplasia. This is an important finding, since DIC occurs as a lethal complication in advanced cancers, including those of the breast.

DTIC

Cancer; Mammary Glands

20040010741 Sir Mortimer B. Davis Jewish General Hospital, Montreal, Quebec, Canada

Genetically Engineered Autologous Cells for Antiangiogenic Therapy of Breast Cancer

Eliopoulos, Nicoletta; Galipeau, Jacques; Jul. 2003; 52 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0477

Report No.(s): AD-A418886; No Copyright; Avail: CASI; [A04](#), Hardcopy

Cancer growth and spread depends on the orchestrated proliferation of tumor-associated blood supply. Cancer cells release signals that instruct the body to build new blood vessels (angiogenesis) required to feed the tumor as it increases in size. Pharmacological agents, i.e. proteins and derivatives, that interfere with angiogenesis, in cancer bearing mice, stop cancer growth and lead to its regression. Animal modeling has revealed that repeated administration of large amounts of such antiangiogenic proteins is required for anti- cancer effect. This may be logistically difficult to achieve in larger beings such as humans. A remedy to this problem would involve a combined cell and gene therapy approach. We propose that normal tissue such as marrow stromal cells (MSCs) can be harvested from patients and engineered to secrete therapeutic proteins. The tissue would be genetically engineered in the laboratory and subsequently returned to the patient as an implant releasing on a continuous basis therapeutic proteins that interfere with cancer growth and spread. We have already developed and published many of the key components required to develop this novel therapeutic modality and have shown promising initial results with Interleukin-12- secreting MSCs in a mouse model of breast cancer.

DTIC

Mammary Glands; Cancer; Blood Vessels; Gene Therapy

20040010742 Beth Israel Deaconess Medical Center, Boston, MA, USA

The Role of Neuropilin in Breast Cancer Metastasis

Libscomb, Elizabeth A.; Mercurio, Arthur M.; Jun. 2003; 48 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0301

Report No.(s): AD-A418890; No Copyright; Avail: CASI; [A03](#), Hardcopy

Our group has recently characterized a novel autocrine survival pathway in breast carcinoma cells mediated by vascular endothelial growth factor binding to neuropilin-1 and stimulation of the phosphatidylinositol 3 -kinase pathway. The goal of this proposal is to define the mechanism by which neuropilin-1 contributes to the survival and metastasis of breast carcinoma cells. Because neuropilin-1 promotes tumor cell survival, we hypothesize that neuropilin-1 plays a critical role in breast cancer metastasis. To investigate this hypothesis, the expression of neuropilin- 1 in human breast tumors was examined as a function of disease progression. We found that neuropilin-1 was expressed at a low level in tumor cells but that the level of neuropilin-1 did not increase with disease progression. In addition, our current data suggest that the cytoplasmic domain of neuropilin- 1 does not play a role in its pro-survival function. To investigate the ability of neuropilin-1 to directly promote spontaneous metastasis in vivo, we have generated a cell line that constitutively downregulates neuropilin-1 expression. Future studies using this cell line will explore the importance of neuropilin- 1 expression in vivo for the progression of tumorigenic breast carcinoma cells to the metastatic phenotype.

DTIC

Stimulation; Neoplasms; Survival; Neurophysiology; Metastasis; Mammary Glands; Cancer

20040010743

The Genome of Bacillus cereus 14579: A Local Analysis

Berger, Bradley J.; Oct. 2003; 221 pp.; In English

Report No.(s): AD-A418893; DRDC-TM-2003-114; No Copyright; Avail: CASI; [A10](#), Hardcopy

Due to its close genetic and biochemical identity to *Bacillus anthracis*, *B. cereus* can be used as a lower risk pathogen in order to model anthrax biochemistry. The recent sequencing of the *B. cereus* 14579 genome has assisted in this process. This report presents the results of a locally performed analysis and annotation of the *B. cereus* 14579 genome. 4885 putative open reading frames were detected, with 2946 of these identified through homology searching. These identified gene products were then used for metabolic reconstruction of the organism, with an emphasis on potential enzymes involved in regenerating methionine from methylthioadenosine. The present results demonstrate the ease and utility of local genome analysis as a tool for assisting in research studies at DRDC Suffield.

DTIC

Bacillus; Genome

20040010745 Cornell Univ., Weill, NY, USA

Oxidative Damage in Parkinson's Disease

Beal, M. F.; Oct. 2000; 49 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8619

Report No.(s): AD-A418896; No Copyright; Avail: CASI; [A03](#), Hardcopy

The objective of the present research is to determine whether there is a coherent body of evidence implicating oxidative damage in the pathogenesis of Parkinson's Disease and the MPTP model of Parkinsonism. We found that there are significant decreases in alpha-ketoglutarate dehydrogenase complex and a significant increase in tissue malondialdehyde levels in the superior frontal cortex, the Parkinsonian syndrome known as Progressive Supranuclear Palsy. We are continuing studies looking at in situ hybridization probes for free radical enzymes. We have developed a novel column-switching assay for measurement of the oxidative marker of DNA damage in human body fluids. We have recently applied this to ALS patients and have found significant increases. We have also developed a novel assay for nitrogamma tocopherol, a marker for oxidative damage mediated by peroxynitrite. We are presently collecting samples from Parkinson's Disease patients to carry out measurements. We have continued our studies showing that oxidative damage plays a critical role in MPTP toxicity. We found that mice, which were deficient in cellular glutathione peroxidase, showed increased sensitivity to MPTP toxicity, which was accompanied by increases in free radical production. We also demonstrated that administration of MPTP to primates results in increased alpha-synuclein in the substantia nigra. These studies have, therefore, made significant progress on the original aims of the proposal.

DTIC

Nervous System; Deoxyribonucleic Acid; Oxidation; Parkinson Disease

20040010756 California Univ., Los Angeles, CA

The Role of Myoepithelial Maspin in Breast Carcinoma Progression Diagnosis and Screening

Barsky, Sanford H.; Aug. 2003; 65 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD71-00-1-0176

Report No.(s): AD-A418768; No Copyright; Avail: CASI; [A04](#), Hardcopy

In glandular organs, a precancerous state precedes invasive carcinoma. In the breast, this state is recognized as DCIS and consist of an epithelial cell proliferation confined by myoepithelial cells. Our laboratory has established cell lines/xenografts of myoepithelial cells. Our myoepithelial cell lines inhibit invasion and motility of breast carcinoma line in vitro largely through maspin. The overall hypothesis of this proposal was how does myoepithelial maspin regulate breast (DCIS) carcinoma progression and can its detection in fine needle aspirates (FNA) and in ductal fluid abet diagnosis and screening? The first aim addressed the mechanism of maspin's inhibition of breast carcinoma invasion: We have shown that myoepithelial maspin does bind to plasma membranes of carcinoma cells and inhibit a pathway involved in cellular locomotion. Using mRNA expression profiling we have further characterized the pathway(s) involved. Furthermore we have shown that myoepithelial cells exhibit by mRNA expression profiling a common tumor-suppressor phenotype. The second aim utilized maspin antibodies on FNA to identify the myoepithelial component and we have further demonstrated prospectively with larger number of samples that this approach is successful. The third aim investigated the levels of maspin in nipple aspirates, in ductal lavage fluid and saliva. We have shown that maspin is both a tumor marker as well as a surrogate intermediate end point marker.

DTIC

Cancer; Diagnosis; Antibodies

20040010757 Vanderbilt Univ., Nashville, TN

Portable Physical Activity Monitors for Measuring Energy Metabolism in ROTC Cadets

Chen, Kong Y.; Sep. 2003; 38 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0716

Report No.(s): AD-A418769; No Copyright; Avail: CASI; [A03](#), Hardcopy

The announcement of the Research Program in Technologies for Metabolic Monitoring (DAMD17- BAA-TMM02) called for new, novel and unconventional approaches to the field of metabolic monitoring. Given the significance of physical activity and energy expenditure (EE) to health for both military and civilian populations, we proposed a feasibility study to achieve the following goals: 1) to develop and validate non-invasive portable techniques in monitoring detailed physical activity and accurately predict EE, and 2) to determine specific physical training related energy costs and physiological responses in ROTC cadets. The specific tasks are: 1) To measuring physical activity and EE under laboratory conditions. 2) To develop accurate EE prediction models. 3) To measure energy demands during field training in ROTC cadets. 4) To perform nutritional and fitness assessments. We have designed a two-stage data collection periods, expanding one academic year (Fall-Spring). Despite several delays, we initiated the studies in September 2003. Up- to-date, we have collected 58, 83, and 100% data for tasks 1,3 and 4, respectively, for the 1st stage assessments. We will complete this stage at the end of November 2003 and the data processing for task 2 will be performed. Phase 2 of the study is being planned.

DTIC

Metabolism; Energy Consumption; Data Acquisition

20040010763 Naval Aerospace Medical Research Lab., Pensacola, FL

The War Fighter's Stress Response: Telemetric and Noninvasive Assessment

O'Donnell, Amanda; Morgan, Charles A.; Jovanov, Emil; Andrasik, Frank; Prevost, Michael C.; Oct. 2003; 86 pp.; In English

Contract(s)/Grant(s): MIPR-2BCJYG2041

Report No.(s): AD-A418770; No Copyright; Avail: CASI; [A05](#), Hardcopy

Our investigations into the effects of stressful military training have shown that individuals exhibiting superior performance differ significantly from individuals exhibiting poor performance in their psychological and biological responses to stress. Specifically, stress-hardy individuals retain mental focus and clarity of memory under stress, commit fewer errors during stress, experience less burnout, demonstrate better navigational skills, and are able to stay physiologically calmer during potentially life threatening events and during uncontrollable stress. To ascertain individual differences in stress responses, we will investigate the effects of stressful military training on physiological, and cognitive functioning of armed forces members. Noninvasive saliva sampling will be used to assess hormonal stress levels. A 6-month no cost extension has been filed. Due to Institutional Review Board delays no human subjects data are available for this annual report. Additionally we developed novel telemetric technology for untethered measurements of heart rate activity. We will compare these physiological measures with training performance, cognitive performance and measures of stress.

DTIC

Hormones; Cognition; Heart Rate; Biological Effects

20040010766 Vanderbilt Univ., Nashville, TN

Growth Inhibitory and Stimulatory Signals in Prostate Cancer

Matusik, Robert J.; Apr. 2003; 165 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0105

Report No.(s): AD-A418771; No Copyright; Avail: CASI; [A08](#), Hardcopy

Substantial progress has been made by the DOD funded Vanderbilt Prostate Cancer Center (VPCC) to evaluate the growth stimulator and growth inhibitory pathways in the development of prostate cancer. The VPCC research group has expanded both in personnel and disciplinary approaches to study prostate cancer. A number of investigators are now working on existing and developing new mouse models for prostate cancer. In addition the researchers have developed new funding to start translational programs on the treatment of prostate cancer. The established of the VPCC by the DOD funding has made this possible. The VPCC will continue to exist and is pursuing new sources of funding to maintain and expand the existing program. The research program funded has established that a loss of the growth inhibitory signal (TGFbeta) in the prostate will increase prostatic metastatic tumor burden. We have been surprised to discover that the loss of this inhibitory signal process by the stromal cells rather than the epithelial cells are key to this process. Further, we have shown that Overexpression of the growth stimulatory signal (TGFalpha) plus loss the inhibitory signal gives a selective advantage to the prostate tumor to survive in the face of androgen ablation therapy. Although funding of this Center is ending, the research stated has now

expanded into other programs with support from both the DOD and NIH which will allow the programs to continue.
DTIC

Prostate Gland; Cancer; Metastasis

20040010768 California Univ., San Diego, La Jolla, CA

Induction of Cytotoxic T Lymphocytes for Immunotherapy of Breast Cancer

Minev, Boris R.; Aug. 2003; 63 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0184

Report No.(s): AD-A418851; No Copyright; Avail: CASI; [A04](#), Hardcopy

Cytotoxic T lymphocytes (at) play an important role in eradicating tumor cells. The purpose of this project is to determine whether fusion peptides composed of insertion signal- sequences and peptides derived from the breast cancer antigen HER2/neu can improve antigen presentation and induce antitumor Cm with higher efficiency against breast cancer. We demonstrated that the addition of synthetic signal sequence at the NH₂-terminus, but not at the COOH-terminus, of the HER2/neu epitopes greatly enhanced their presentation in antigen processing deficient cells, breast cancer cells and dendritic cells. Importantly, peptide constructs, composed of the HER2/neu epitopes replacing the hydrophobic part of the signal sequences were the most effective. The efficiency of the signal sequences in facilitating the HER2/neu peptide presentation was confirmed also by using IFN- γ release assays. We also studied the mechanisms involved in the enhancement of antigen presentation by the fusion peptides, and proved that the effective presentation of the loaded peptide constructs is a result of their efficient loading into the cytosol and not simple binding to the surface HLA molecules. These findings may be of practical significance for the development of synthetic anticancer vaccines and in vitro immunization of Cm for adoptive immunotherapy.

DTIC

Cancer; Lymphocytes; Mammary Glands

20040010777 Connecticut Univ., CT, USA

Monitoring Cancer Oxygenation Changes Induced by Ultrasound

Piao, Daqing; Zhu, Quing; Jul. 2003; 8 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0358

Report No.(s): AD-A418861; No Copyright; Avail: CASI; [A02](#), Hardcopy

This research is aimed at testing a new hypothesis that oxygen delivery to the localized tumor region can be enhanced by ultrasound at the diagnostic radiation level. A new portable frequency-domain multi-channel three-wavelength near infrared (NIR) diffusive imager has been built and calibrated for oxygenated hemoglobin and deoxygenated hemoglobin measurements. A 128-channel ultrasound system has been instrumented for insonification. A total of 3 Fisher rats were injected with the cancer cell line of 9L/Laz (gliosarcoma) and exposed to ultrasound. The ultrasound intensity has been controlled by adjusting the voltage and the pulse repetition - frequency. Dramatic changes were observed consistently in one rat, and further experiments are planned to verify the findings.

DTIC

Ultrasonics; Deoxygenation; Diagnosis; Cancer; Monitors

20040010778 Kentucky Univ., Lexington, KY, USA

Research Training in Biopsychosocial Breast Cancer Research

Andrykowski, Michael A.; Jul. 2003; 81 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9245

Report No.(s): AD-A418864; No Copyright; Avail: CASI; [A05](#), Hardcopy

This report summarizes accomplishments for the 4th year of a 4 year training program in biopsychosocial breast cancer (BC) research. Two trainees (1 postdoctoral; 1 predoctoral) were reappointed to the training program for the period 7/2002 through 6/2003. Two other trainees (1 postdoctoral; 1 predoctoral) were newly appointed to the training program during the project year. Research training was furnished by a multidisciplinary faculty of 6. The training program consists of 5 components, all of which were implemented during 2002-2003. All trainees participated in a biweekly seminar enabling oversight of trainee activities, didactic presentation of clinical aspects of BC, and discussion of ongoing and anticipated BC-related research projects. Trainees also received supervised guidance in all phases of the research enterprise. Specifically, trainees participated in: (1) development and implementation of 1 group research project and 2 trainee-specific research projects; (2) ongoing data collection, preparation, and analysis for 1 other ongoing group project; and (3) manuscript

preparation for 2 completed research projects. A no-cost extension of the training program for a 5% project year was requested and approved and 1 new predoctoral trainee was recruited and appointed for 2003-2004.

DTIC

Cancer; Mammary Glands; Medical Science

20040010795 University of Southern Mississippi, Hattiesburg, MS

Marine Mammal Health: Development of Immunodiagnostic and Viral Diagnostic Methodologies and Reagents

Middlebrooks, B. L.; Patterson, R. A.; Nov. 29, 2003; 5 pp.; In English

Contract(s)/Grant(s): N00014-98-1-0602

Report No.(s): AD-A418900; No Copyright; Avail: CASI; [A01](#), Hardcopy

Reagents and methods/procedures were developed to permit evaluation of general humoral immune status and immune status relative to specific pathogens in cetaceans marine mammals. Immunoglobulin isotypes IgG1, IgG2, IgA, and IgM were purified and poly- or monoclonal antibodies specific for these isotypes were developed. ELISA assays for - immunodiagnosis of past exposure to *Erysipelothrix rhusiopathiae*, a bacterial pathogen of cetaceans, were developed. Tissue culture lines from three species of cetaceans were established and evaluated for virus susceptibility and culture characteristics.

DTIC

Viruses; Immunoassay; Diagnosis; Culture Techniques; Marine Mammals

20040010811 South Carolina Univ., Columbia, SC, USA

Studies on the Novel Anticancer Agents Metabolically Formed from 17-Beta-Estradiol

Lee, Anthony J.; Jun. 2003; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0566

Report No.(s): AD-A418901; No Copyright; Avail: CASI; [A02](#), Hardcopy

By using NMR and mass spectrometric analyses, we determined the structures of X1 and X2, two representative nonpolar estrogen metabolites, which were metabolically formed following multiple large-scale incubations of 17 beta- estradiol with human CYP3A4 and NADPH. Both X1 and X2 were unequivocally identified to be the dimers of 17 beta-estradiol, connected together through a diaryl ether bond between a phenolic oxygen atom of one 17 beta-estradiol molecule and the 2- or 4-position aromatic carbon of another estrogen. This is the first report for a novel class of the nonpolar 17 beta- estradiol dimers that are formed from 17 beta- estradiol by human Cyp isoforms in the presence of NADPH as a cofactor.

DTIC

Metabolites; Estrogens; Nuclear Magnetic Resonance

20040010812 Stanford Univ., Stanford, CA, USA

Combining Electron With Intensity Modulated Photon Beams for Breast Cancer

Xing, Lei; Jul. 2003; 185 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0635

Report No.(s): AD-A418907; No Copyright; Avail: CASI; [A09](#), Hardcopy

A hybrid breast cancer treatment technique using electron and intensity modulated photon was developed. The technique took advantage of the useful features of the two types of beams and showed significant promise to improve the current breast irradiation technique. Technically, the weight of the electron beam and the fluence profiles of the IMRT beams were optimized simultaneously with the goal of generating a uniform composite dose distribution in the target volume. We have (i) developed an effective algorithm for the hybrid optimization with the regional dose modifiable by a regional penalty scheme; (ii) explored the feasibility of further improving the technique by intensity- and energy- modulate the electron beam; (iii) developed software to incorporate MLC transmission and head scatter into IMRT delivery to ensure accurate dose delivery; (iv) demonstrated the dosimetric advantage of the hybrid approach; (v) evaluated the matching of electron and IMRT beams against the setup errors; and (vi) explored the feasibility of combining intensity- and energy-modulate electron beam and IMRT for breast irradiation. The development provides a viable alternative for clinically difficult breast cases. Using the technique, the high doses to the lung and heart were markedly reduced with minimal increase in the dose to other normal structures.

DTIC

Electrons; Photon Beams; Mammary Glands; Cancer

20040010813 Georgetown Univ., Washington, DC, USA

The Role of a FGF-Binding Protein in Breast Cancer

Wellstein, Anton; Oct. 2002; 34 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9207

Report No.(s): AD-A418908; No Copyright; Avail: CASI; [A03](#), Hardcopy

We studied the expression and regulation of the secreted FGF-BP protein that can enhance FGF activity and studied its impact in vivo. In human tissues we found that FGF-BP is significantly elevated in its expression in invasive breast cancers (approximately 112 of invasive breast cancers) and rarely found expressed in normal breast tissue or in non-invasive in situ carcinoma. We report a significant, positive correlation of FGF-BP expression with the estrogen receptor status of the cancers. We demonstrate transcription factors binding to the FGF-BP gene promoter and show that members of the C/EBPbeta family are crucial transcriptional factors binding to the promoter. We show regulation by EGF of this binding. We initiated the generation of conditional, regulated transgene expression in mice due to the embryonically lethal phenotype observed with constitutively active promoters driving the transgene. As an alternative model, transient transgene expression in chicken embryos is initiated to assess to what extent embryonic toxicity can be monitored in this new model.

DTIC

Cancer; Mammary Glands; Proteins; In Vivo Methods and Tests

20040010823 Ohio State Univ., Columbus, OH

Development of an erbB Antagonist

Simcox, Amanda A.; Jul. 2003; 58 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9340

Report No.(s): AD-A418926; No Copyright; Avail: CASI; [A04](#), Hardcopy

Receptor tyrosine kinases of the erbB family play pivotal roles in growth and differentiation and aberrant activation of these receptors is associated with human cancers. In particular, ErbB-2 dysfunction has been linked to about 30% of breast cancers with poor prognosis. Correspondingly, great efforts are being made to develop therapies that target ErbB pathways. ErbB-2 is activated by the neuregulins in heterodimers with the neuregulin receptors ErbB-3 and ErbB-4. An antagonistic neuregulin that down regulates ErbB signaling could function as an anti-tumor agent. The purpose here is to develop such a factor. In previous work, the Drosophila system was used to demonstrate that an antagonistic neuregulin-like factor could be made by deleting the EGF domain or by insertion of the EGF domain from a natural inhibitor. In this project, a vertebrate neuregulin-1 with an EGF domain deletion (NRGAEGF) and a factor with the EGF domain from the inhibitor (NRG::Aos-EGF) were made. The activity of the factors was tested in transgenic mice by examining heart defects which are characteristic of neuregulin defects. No defects were observed. The results suggest the factors are unlikely to be useful in regulating NRG function in the breast.

DTIC

Neoplasms; Metabolites; Cancer; Genetics; Receptors (Physiology); Mammary Glands

20040010827 Georgetown Univ., Washington, DC, USA

The Role of a FGF-Binding Protein in Breast Cancer

Wellstein, Anton; Oct. 2000; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9207

Report No.(s): AD-A418912; No Copyright; Avail: CASI; [A03](#), Hardcopy

We studied the role and regulation of a secreted, FGF binding protein (FGF-BP) in breast cancer. We established a method to detect FGF-BP mRNA in paraffin-bedded archival breast cancer samples using in situ hybridization. We show feasibility of the technique for breast cancer tissues. We surveyed breast cancer cell lines and show that EGF-receptor overexpressing MDA-MB 468 human breast cancer cells express high levels of FGF-BP mRNA that is detectable by Northern blot analysis. We demonstrate that the FGF-BP gene is regulated in these breast cancer cells by the growth factor EGF. We show that the MAP kinase p38 is crucial in the transduction of the EGF signal towards FGF-BP regulation in MDA-MB 468 cells.

DTIC

Growth; Proteins; Fibroblasts; Mammary Glands; Cancer

20040010832 Pittsburgh Univ., Pittsburgh, PA

Center for Behavioral Research: Individual Interventions for Breast Cancer Patients

Baum, Andrew; Jan. 2003; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0373

Report No.(s): AD-A418934; No Copyright; Avail: CASI; [A02](#), Hardcopy

This is an annual report for the Center for Biobehavioral Research in Breast Cancer, a center of excellence that was initially funded in September, 2001. The Center was designed to support, stimulate, conduct, and disseminate research and research reports on the biological and behavioral interactions characterizing the development and progression of breast cancer as well as treatment and Survivor effects. Behavioral variables, particularly those directly related to activity in biological regulatory systems and defense systems, appear to be key determinants of participation in early detection and prevention programs, effective use of chemoprevention agents, and in patient adjustment, caregiving, and quality of life. This multidisciplinary Center is devoted to the investigation of biobehavioral pathways underlying breast cancer prevention and control, including development of research and training, involving participation by behavioral scientists, oncologists, nurses, social workers, psychiatrists, immunologist, and molecular biologists. These activities are directed towards organization, stimulation, and facilitation of integrated biobehavioral research aimed at prevention and control of breast cancer. The Center has assembled an interacting group of behavioral, biological, and medical scientists to foster new collaborations and extend existing ones in the context of training and education about breast cancer. These training Opportunities, free exchange of ideas, and regular interaction will supplement and connect research activity on proposed projects as well as research cores that support this research. Integration of theory, cross-cutting research themes, and multidisciplinary training has begun to produce novel ways of thinking about breast cancer research and innovative, Patient- focused research activity.

DTIC

Physiology; Behavior; Cancer; Mammary Glands; Stimulation; Medical Science; Prevention

20040010838 Virginia Commonwealth Univ., Richmond, VA

Determining Effects of Genes, Environment, and Gene X Environment Interaction That Are Common to Breast and Ovarian Cancers Via Bivariate Logistic Regression

Ramakrishnan, Viswanathan; Jul. 2003; 54 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0662

Report No.(s): AD-A418938; No Copyright; Avail: CASI; [A04](#), Hardcopy

A new method for the simultaneous genetic analysis of two or more discrete traits such as the presence of breast and ovarian cancers in twins was developed. A generalized estimation equations (GEE) logistic regression model was used for the modeling. A shared trait is defined for two discrete traits based upon explicit patterns of trait concordance and discordance within twin pairs; this shared trait is assessed for the influence of additive genetic and/ or common environmental effects. Data are summarized in the form of 2 x 2 tables (for monozygotic and dizygotic twins) by combining appropriate cells from the 16-cell multinomial distribution to define the individual and shared trait. Hypothesis tests for additive genetic and common environmental influence are performed using repeated measures logistic regression via the GEE approach. The model specification is highly flexible accounts for the correlated structure of the parameter estimates and does not require multivariate normality assumption for the underlying liability distribution. The approach was applied to data sets from the Vietnam Era Twin Registry and the Mid Atlantic twin Registry. Currently, efforts are being taken to collect adequate data on cancer outcomes that will provide enough power to apply this methodology to twins with cancer.

DTIC

Genes; Bivariate Analysis; Cancer; Mammary Glands; Ovaries

20040010839 California Univ., Los Angeles, CA

Impact of Breast Cancer Treatments on Gonadal Function and Reproduction Health

Ganz, Patricia A.; Oct. 2003; 27 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8180

Report No.(s): AD-A418940; No Copyright; Avail: CASI; [A03](#), Hardcopy

This fifth and final year has been spent analyzing data and reporting on the multiple phases of the Cancer and Menopause Study (CAMS). The main results paper on the baseline CAMS data, 'Breast Cancer in Younger Women: Reproductive and Late Health Effects of Treatment,' was completed and accepted for publication by the Journal of Clinical Oncology. Two additional papers have been submitted to peer-reviewed journals for consideration, and a third has been accepted for publication. These papers include analyses on the relationship between cancer survivors' treatment experience and quality of life with 1) physical activity, 2) menopausal transition and symptoms and 3) cognitive function. Additional analyses are currently underway to examine more CAMS data, including investigation of bone density, fatigue, use of complementary and alternative medicines, biologic markers and body composition data, and their relationship to various facets of the cancer survivor experience.

DTIC

Mammary Glands; Cancer; Reproductive Systems; Clinical Medicine; Gonads

20040010840 Arizona Univ., Tucson, AZ

Dynamic Tissue Culture from Prostate Biopsy Specimens as a model for Predicting Tumor Radiosensitivity to Ionizing Radiation Treatment

Nyman, David W.; Aug. 2003; 37 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0223

Report No.(s): AD-A418949; No Copyright; Avail: CASI; [A03](#), Hardcopy

Prostate cancer is the most common non-cutaneous malignancy in men. Radiation therapy is a common treatment for this disease however, most patients receive a similar dose of radiation (70-76 Gy) regardless of individual clinical, pathological, or molecular characteristics of the tumor. The hypothesis of this project is that all prostate carcinomas are unique and that by identifying specific tumor markers or other molecular characteristics using our dynamic tissue culture system (Parrish et al, 2002), we can identify those tumors most sensitive to radiation therapy. The specific aims for the first year were to use prostate biopsy tissue, obtained retrospectively, and adapt our organ culture technique to the requirements of prostate biopsy specimens. We have been able to determine the optimal biopsy core size and tissue culture medial conditions. We have also demonstrated that basal cells present in the prostate glandular tissue proliferated over the 72 hour time period of organ culture. We have maximized the length of time that tissue remains viable in our dynamic tissue culture system. We are now ready to begin Aim II of the proposal determining the baseline radiosensitivity of prostate tissue and assessing the roles of p53, bcl-2, and NFkB in the intrinsic radiosensitivity of prostate tissue. We hope to further profile these biomarkers and using them to predict prostate tissue radiosensitivity will aid in the diagnosis and prognosis of this significant cancer.

DTIC

Cells (Biology); Ionizing Radiation; Prostate Gland; Cancer; Culture Techniques; Human Beings; Mathematical Models

20040010849 Michigan Univ., Ann Arbor, MI

Prostate Carcinoma Detection Using Combined Ultrasound, Elasticity, and Tissue Strain-Hardening Imaging

Emelianov, Stanislav Y.; Jul. 2003; 12 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0097

Report No.(s): AD-A419173; No Copyright; Avail: CASI; [A03](#), Hardcopy

The underlying hypothesis of this study is that remote, non-invasive measurements of elasticity in prostate glands are possible and can provide unique examiner-independent information that can increase the detection and/or characterization of potentially malignant masses in the prostate not accessible to manual palpation. The purpose of this study is to develop ultrasound technology to produce high-resolution displacement and strain data throughout the prostate for remote evaluation of the strain-dependent elastic (Young's or shear) modulus. To this end, the main objective of this research program is to test the hypothesis that quantitative elasticity images of the prostate can be obtained with real-time ultrasound. To achieve this objective, the authors have developed speckle tracking algorithms and methods for strain and elasticity imaging of the prostate. These studies include adaptive displacement and strain imaging, incompressibility processing, and strain-hardening imaging. Next, they will test the developed methods using tissue-mimicking and tissue-containing phantoms, and well-defined clinical studies. At the conclusion of the study, a prototype of the clinical prostate ultrasound elasticity imager will be designed. The overall program is intended to demonstrate that combined ultrasound, elasticity, and strain-hardening imaging permits surrogate, remote palpation of the prostate gland.

DTIC

Cancer; Elastic Properties; Prostate Gland; Ultrasonics; Tissues (Biology); Strain Hardening; Imaging Techniques

20040010850 Dartmouth Coll., Hanover, NH

Effect of a Single Nucleotide Polymorphism (NP) on Breast Cancer Invasion

Wyatt, Colby A.; Brinckerhoff, Constance E.; Jul. 2003; 19 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0223

Report No.(s): AD-A418964; No Copyright; Avail: CASI; [A03](#), Hardcopy

This study took several approaches to determine the influence of a single nucleotide polymorphism (SNP) in the matrix metalloproteinase 1 promoter on gene transcription in normal and breast cancer cell lines or tissue. The SNP consists of an extra guanine nucleotide that creates an ETS family transcription factor binding site (2G), and we previously demonstrated that the 2G SNP leads to an increase in transcriptional activity of the MMP-1 promoters containing the 2G SNP can interfere with transcriptional activity of promoters with the 1G SNP, but only at high concentrations of DNA. Analysis of five breast cancer cell lines with transient transfections reveals that the transcriptional effect of the 2G SNP is only observed in one cell line, and this cell line was the only one examined that expressed endogenous MMP-1. The influence of the SNP on endogenous MMP-1 expression was examined in 34 human foreskin fibroblasts (HFFs). From these data we can conclude that the MMP-1

promoter genotype of normal fibroblasts is not predictive of MMP-1 expression. The SNP genotypes of 35 breast cancer patients were determined, and from these data, we can conclude that the SNP has no influence on MMP-1 production from diseased breast tissue. We can block MMP-1 production using short interfering RNA (siRNA) molecules, and have developed a powerful tool to determine the importance of MMP-1 in an in-vivo model of breast cancer metastasis.

DTIC

Polymorphism; Nucleotides; Metastasis; Cancer; Mammary Glands; Deoxyribonucleic Acid

20040010852 Chicago Univ., Chicago, IL

Neoadjuvant Anti-Angiogenesis Therapy for Prostate Cancer

Sokoloff, Mitchell H.; Aug. 2003; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0231

Report No.(s): AD-A419174; No Copyright; Avail: CASI; [A02](#), Hardcopy

This protocol is designed to evaluate the effects of combined anti-angiogenesis and androgen ablation therapy in men at high risk for recurrence after radical prostatectomy. Both clinical (i.e., pathologic, disease-free survival, safety) and molecular factors will be evaluated. A clinical trial to test the effectiveness of this therapy was initiated in January 2003. After a slow initial accrual recruitment has been increasing steadily. It is still too early to evaluate the anti-cancer efficacy of combined androgen ablation and anti-angiogenesis therapy, however, the drug has been well tolerated and there have been no surgically related complications. As more men are enrolled and undergo treatment, the author will be able to evaluate the effects of this therapy on the natural history of prostate cancer.

DTIC

Cancer; Prostate Gland; Therapy; Ablation; Clinical Medicine; Drugs

20040010853 Baylor Coll. of Medicine, Houston, TX

Mechanism of Mutation in Non-Dividing Cells

Ponder, Rebecca G.; Rosenberg, Susan; Jul. 2003; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0145

Report No.(s): AD-A418965; No Copyright; Avail: CASI; [A03](#), Hardcopy

Stationary-phase mutation can be induced in non-dividing cells after exposure to environmental stress. The mutations require the SOS-induced, error-prone polymerase DAN pol IV and DNA double-strand break (DSB) repair and recombination proteins. Sex plasmid transfer proteins are required for mutation of lac on the F'; transfer functions induce single-strand nicks that might become DSBs. We find that introducing specific breaks in cis to lac in the absence of transfer functions results in -1000-fold stimulation of Lac+ stationary-phase mutation, including both frameshift reversions and lac gene amplifications. The mutation requires recombination proteins and pol IV, implying that these components act downstream of DSBs. DSBs made in trans to lac promote Lac+ mutation only poorly. We suggest adaptive mutations result from error-prone DNA synthesis primed during recombination-mediated DSB-repair, and the small stimulation provided by DSBs in trans results from SOS induction and increased pol IV. Notabl, we report that DSBs made in trans can promote Lac+ mutation if a region of DNA homology with the trans plasmid is provided near lac. Finally, we find that DSBs are not sufficient to activate mutation: DSB-activated mutation has not been observed in rapidly growing cells and requires RpoS, the stationary-phase and general stress response regulator.

DTIC

Mutations; Cell Division; Cancer; Mammary Glands

20040010856 Naval Health Research Center, San Diego, CA

Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries

Smith, T. C.; Smith, B.; Ryan, M. A. K.; Gray, G. C.; Hooper, T. I.; Heller, J. M.; Dalager, N. A.; Kang, H. K.; Gackstetter, G. D.; Jan. 2001; 13 pp.; In English

Report No.(s): AD-A418969; NHRC-01-29; No Copyright; Avail: CASI; [A03](#), Hardcopy

For more than a decade after the gulf War, there has been concern that wartime exposures have resulted in significant morbidity among Gulf War veterans. After the end of the war, the Department of Veterans Affairs (VA) and the Department of Defense (DoD) initiated health registries to provide systematic clinical evaluations of Gulf War veterans who chose to participate. By September 1999, there were 32,876 participants in the DoD Comprehensive Clinical Evaluation Program and 70,385 participants in the VA Gulf War Registry Health Examination Program. Demographic and military service factors were

identified as well as potential war-related exposures associated with subsequent registry participation after 10 years of observation. Veterans potentially exposed to oil well fire smoke, those near Khamisiyah, Reserve and National Guard, Army veterans, and veterans in the theater of operations during intense combat periods were most likely to elect to participate in a registry. These findings support the hypothesis that certain occupational factors and wartime exposures may influence subsequent health care-seeking behavior.

DTIC

Health; Armed Forces (United States); Management

20040010865 Naval Health Research Center, San Diego, CA

Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego

Lane, Suzanne E.; Young, Sylvia Y.; Bayer, Lisa; Hogan, Beverly; Hyams, Kenneth C.; Ryan, Margaret A.; Jan. 2002; 63 pp.; In English

Report No.(s): AD-A418976; NHRC-TR-02-17; No Copyright; Avail: CASI; [A04](#), Hardcopy

The collection of baseline health data in military personnel is important for force health protection, and crucial to the evaluation of health-related issues facing the military. The Recruit Assessment Program is a proposed Department of Defense initiative designed to collect baseline data from all new accessions. It has been successfully implemented at the Marine Corps Recruit Depot, San Diego, under the direction of the Department of Defense Center for Deployment Health Research at the Naval Health Research Center, and in cooperation with the Marine Corps training community. Implementation has demonstrated the benefit of the Recruit Assessment Program as an instrument for collecting baseline health data, and it has established the feasibility of its use in military training environments.

DTIC

Surveys; Defense Program; Deployment; Personnel; Armed Forces

20040010868 Georgetown Univ. Hospital, Washington, DC, USA

The Role of AKT1 in Mammary Tumorigenesis and Transformation

Glazer, Robert I.; Sep. 2003; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9195

Report No.(s): AD-A418942; No Copyright; Avail: CASI; [A03](#), Hardcopy

AKT1 belongs to the AKT/PKB protein-serine kinase family and is the cellular homolog of the v-akt oncogene. Gene amplification and overexpression of AKT are associated with adenocarcinomas of the stomach, breast, ovary, and pancreas. AKT1 is coupled to growth factor-dependent proliferation and resistance to apoptosis, but these processes have not been studied in either mammary epithelial cells or in breast cancer. The broad objectives of this proposal are to determine the role of the AKT1 in the proliferation, survival and transformation of mammary epithelial cells using two transgenic mouse strains in which expression of either AKT1 or a constitutively active form of AKT1 is directed to the mammary gland under the control of a mammary gland-specific promoter. The use of these two transgenic models will allow determination of the role of AKT1 in mammary gland hyperplasia, dysplasia and tumorigenesis, and will address the hypothesis that AKT1 is involved in the growth, survival, and transformation of mammary epithelial cells. This hypothesis will be tested using two experimental approaches. First, transgenic mice will be generated with mammary gland-directed expression of wild-type AKT1 or constitutively active myristoylated AKT1 (myrAKT1) to determine their effects on mammary hyperplasia and tumorigenesis. Second, primary mouse mammary epithelial cells will be transduced with ecotropic retroviruses expressing either AKT1 or myrAKT1 to determine their impact on growth factor-dependent proliferation, susceptibility to apoptosis induced by serum deprivation or the P13K inhibitor, LY294002, as well as transformation determined by anchorage-independent growth in soft agar and tumor formation in nude mice. Gene arrays of suppression subtractive hybridization will be used to identify genes modulated by AKT1 that are involved in its anti-apoptotic and proliferative activities.

DTIC

Proteins; Cancer; Mammary Glands; Survival

20040010872 New Jersey Medical School, Newark, NJ, USA

The Roles of FGF-2 TGF Beta and TGF Beta Receptor 2 in Breast Cancer Dormancy

Wieder, Robert; Jul. 2003; 21 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0343

Report No.(s): AD-A418963; No Copyright; Avail: CASI; [A03](#), Hardcopy

Basic Fibroblast growth factor is associated with ductal morphogenesis in mammary duct development and its expression

is lost in breast cancer. We determined the expression of FGF-2 during different stages of mammary carcinogenesis in archived surgical specimens. FGF-2 was expressed in the majority of specimens from normal, benign and atypical hyperplasia, fibrocystic disease and carcinoma in situ, but its expression frequency dropped significantly in invasive cancer. Enforced re-expression of FGF-2 in breast cancer cell lines suggested a causal role for a more differentiated phenotype, including decreased motility and invasiveness. The decreased motility was associated with constitutive and omnidirectional focal adhesion complex activation and rearrangement of actin filaments. In a separate project, we investigated a potential mechanism for dormancy and survival of microscopic metastases in the bone marrow. Our model suggests that FGF-2 in the marrow inhibits proliferation of well-differentiated breast cancer cells and inhibits their survival. FGF-2 induces the overexpression of integrins $\alpha 5$ and $\beta 1$, which in turn bind fibronectin in the microenvironment and initiate survival signaling in these non-proliferating cells, establishing a state of dormancy. The protection afforded by this interaction is specific and provides a potential target for therapeutic intervention.

DTIC

Fibroblasts; Physiology; Cancer; Mammary Glands

20040010878 Thomas Jefferson Univ., Philadelphia, PA

Leptin (Obesity Protein) and Breast Cancer Metastasis

Surmacz, Eva; Aug. 2003; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0651

Report No.(s): AD-A418984; No Copyright; Avail: CASI; [A03](#), Hardcopy

Obesity is a risk factor for breast cancer in postmenopausal women. Adipose tissue is a major source of leptin, a cytokine acting as a key regulator of energy balance. Leptin can also induce mitogenic and angiogenic effects in different cell types. New data suggested that in breast cancer cells, leptin can stimulate proliferation by activating the long form of the Ob receptor (ObR). We hypothesized that in obese women, locally elevated levels of leptin could promote the growth of primary breast tumors. The results of our work indicated that 1) several breast cancer cell lines express the long and short form of the leptin receptor (Ob-R); 2) leptin stimulates the proliferation in different breast cancer cell lines by 30-40%; 3) in MCF-7 cells, leptin activates the ERK1/2 and STAT3 signaling pathways; 4) in MCF-7 cells, leptin interferes with the action of the antiestrogen ICI 182,780 by upregulating the activity of estrogen receptor α . In summary, our data suggested that higher levels of leptin could promote breast cancer cells growth and impede the efficacy of hormonal treatments.

DTIC

Hormones; Obesity; Estrogens; Metastasis; Mammary Glands; Cancer; Proteins

20040010879 Rockefeller Univ., New York, NY

Role of E-Cadherin Homophilic Contacts in the Inhibition of Cell Growth of Primary Breast Cells

Perez-Morano, Mirna; Fuchs, Elaine; Aug. 2003; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0485

Report No.(s): AD-A418986; No Copyright; Avail: CASI; [A03](#), Hardcopy

Cadherins are the primary regulators of the overall state of epithelial cell contact and facilitate an appropriate cytoskeletal organization and the establishment of many other kinds of cell interactions that preserve tissue integrity, thereby leading to the establishment of the density dependent inhibition of growth. However, it remains obscure whether E-cadherin directly transfers growth inhibitory signals to the cells, or if other types of molecular cell interactions indirectly influenced by the establishment of cadherin mediated cell contacts, are responsible for contact inhibition of growth. In this study I selectively activate the formation of E-cadherin homophilic adhesive bonds, using a specific recombinant protein to engage E-cadherin molecules at the cell surface of dispersed primary breast epithelial cells. Here I show evidence that E-cadherin ligation is capable to reduce the rate of cells entered into S-phase, in a process not linked with apoptosis. β -catenin/TCF signaling activity does not appear to be involved in the inhibition of cell growth, since the cells did not display constitutive β -catenin/TCF signaling. Moreover, direct inhibition of β -catenin/TCF signaling pathway was not able to decrease the proliferation rate in these cells, suggesting the involvement of other growth inhibitory signaling pathways in this event.

DTIC

Adhesive Bonding; Cells (Biology); Growth; Mammary Glands; Cancer

20040012582 Roger Williams Medical Center, Providence, RI, USA

Mechanism by which p66 Shc Suppresses Breast Cancer Tumorigenicity

Williams, Lisa R.; Jul. 2003; 8 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0559

Report No.(s): AD-A419190; No Copyright; Avail: CASI; [A02](#), Hardcopy

Considerable evidence suggests that poor prognosis in breast cancer may be due to overly-activated growth-factor receptors such as ErbB2, TGF-1, EGFR, and c-Met. A downstream signaling protein common to all these kinases is the adapter protein, Shc. Shc helps activated growth-factor receptors transfer signals to the c-Ras-MAP kinase pathway. Additionally, Shc appears to signal to Jun kinase, PI3kinase and to c-Myc (implicated in cell proliferation, apoptosis and the stress response). Recently we have reported that many human breast cancer cell lines (but not non-cancerous breast epithelial cell lines) not only harbor constitutively activated (phosphorylated on tyrosine 317) Shc proteins, but also breast cancer cells appear to require signaling from Shc in order to proliferate. A third, 66-kDa splicing isoform, of Shc (p66-Shc) can act as a feedback inhibitor of growth-factor signaling to MAP kinase and to c-fos, and acts as an apoptotic sensitizer for oxidative stress in some cell lines. We have recently reported a strong negative correlation between the cellular levels of activated Shc and cellular expression of the inhibitor p66-Shc isoform. We have also demonstrated that p66-Sch acts as a strong negative growth regulator, as measured by their inability to form colonies in soft agar.

DTIC

Cancer; Mammary Glands; Proteins; Tumors

20040012590 Veterans Medical Research Foundation, San Diego, CA, USA

Alpha Synuclein in a Model of Multiple System Atrophy

Shults, Clifford W.; Sep. 2003; 19 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0759

Report No.(s): AD-A419316; No Copyright; Avail: CASI; [A03](#), Hardcopy

Multiple system atrophy (MSA) is a progressive neurological disorder characterized by parkinsonism, cerebellar dysfunction and autonomic impairment. The cardinal pathological feature of MSA is the glial cytoplasmic inclusion (OCI) in oligodendrocytes, and a major component of OCIs is α -synuclein. We identified an oligodendrocytic precursor cell line, CG-4, that endogenously produces α -synuclein. We characterized alpha synuclein-immunoreactive (alpha synuclein- IR) material in the CO-4 cells (with affection to higher molecular weight forms), and studied the effects of oxidative stress. We also produced CO-4 cells that constitutively overexpress human alpha-synuclein and CO-4 cells that express human alpha-synuclein under control of the tetracycline-ON (inducible promoter) system, and we have characterized both of these.

DTIC

Atrophy; Neurology; Parkinson Disease; Sympathetic Nervous System

20040012592 Nebraska Univ., Omaha, NE, USA

Breast Cancer Training Program

Cowan, Kenneth H.; Aug. 2003; 18 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0361

Report No.(s): AD-A418962; No Copyright; Avail: CASI; [A03](#), Hardcopy

The Breast Cancer Training Program (BCTP) in the Eppley Cancer Institute of the University of Nebraska Medical Center offers predoctoral and postdoctoral trainees a comprehensive training environment in breast cancer by supporting, in part, and outstanding breast cancer seminar program, a short course in cancer biology, a breast cancer focus group and by providing stipend support to trainees performing research that is highly relevant to breast cancer. In the first three years of this award, we have provided stipends to seven predoctoral and nine postdoctoral trainees. Four of the seven of the predoctoral trainees have completed their graduate training and have secured postdoctoral positions in outstanding laboratories in research areas directly related to breast cancer. Four of the postdoctoral trainees have obtained new positions, one is pursuing additional educational training and four remain in training. Publications in highly ranked journals are beginning to result from the research of the BCTP trainees. We are currently evaluating a large group of highly qualified applicants for support in year four.

DTIC

Mammary Glands; Cancer; Education

20040012597 Naval Health Research Center, San Diego, CA

Tuberculosis Infection Among Young Adults Enlisting in the USA Navy

Smith, B.; Ryan, M. A.; Gray, G. C.; Polonsky, J. M.; Trump, D. H.; Jan. 2000; 6 pp.; In English

Report No.(s): AD-A419008; NHRC-00-35; No Copyright; Avail: CASI; [A02](#), Hardcopy

Tuberculosis (TB) is a re-emerging infectious disease threat worldwide. To protect the health and readiness of US military personnel, policies exist to screen for and treat latent TB infection at the time of service entrance. Results of this screening programme have not been recently described. Multivariate regression techniques were used to evaluate demographic and

medical data associated with TB infection among all young adults entering US Navy enlisted service between 1 October 1997 and 30 September 1998. A total of 44 128 adults (ages 17-35, 81% male) were screened for TB during this 12-month period. The prevalence of latent TB infection was 3.5%. Place of birth was very strongly associated with TB infection, with foreign-born recruits eight times more likely to have a reactive tuberculin skin test or history of infection. Those who reported their race as Asian/Pacific Islander had 3.8 times the odds of having evidence of TB infection compared with Caucasian recruits, even after adjusting for place of birth. The prevalence of TB infection among Navy recruits was last reported as 2.5% nearly 10 years ago. The apparent increase to 3.5% in this large cohort is likely due to a concurrent increase in the number of foreign-born recruits, and it serves to underscore the importance of comprehensive screening and treatment of latent TB infections in this population.

DTIC

Tuberculosis; Human Beings; Races (Anthropology)

20040012600 Alabama Univ., Birmingham, AL

Development of a Viral Biological-Threat Bioinformatics Resource

Lefkowitz, Elliot J.; Oct. 2003; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-2-0059

Report No.(s): AD-A419009; No Copyright; Avail: CASI; [A03](#), Hardcopy

In response to the potential use of viruses as biological weapons, we have established the Viral Biological- threat Bioinformatics Resource (VBRR) that collects, catalogs, annotates, and analyzes genetic information related to potential viral threats. This work expands upon available knowledge of virus replication, pathogenicity, and virus-host interactions on the basis of individual protein domains, individual genes, and whole genomes. To date, we have constructed a genome and gene sequence database that has been populated with the sequence information for viruses currently listed on the NIH and CDC priority pathogen list. We have also developed a variety of analytical and visualization tools that aid in the analysis of the genomic information coded for by these viruses. Finally, the information developed as a result of this work has been made available to the scientific community through a (currently access-controlled) web site (<http://vbbr.genome.uab.edu>) that supports research efforts to develop environmental detectors, diagnostics, antiviral compounds, new vaccines, and animal models in support of biodefense research goals.

DTIC

Viruses; Diagnosis; Biological Weapons

20040012624 Naval Health Research Center, San Diego, CA

Cognitive Measures of Vietnam-Era Prisoners of War

Williams, Diane; Hilton, Susan; Moore, J.; Jan. 2002; 4 pp.; In English

Report No.(s): AD-A419048; NHRC-02-01; No Copyright; Avail: CASI; [A01](#), Hardcopy

Experience as a prisoner of war (POW) could lead to cognitive impairment because of the injuries, including head trauma, and other stressors endured preceding and during capture, and during incarceration. Some research has reported decreased cognitive performance in repatriated POWs (RPOWs), while other research has found no cognitive impairment. The objective of this research is to assess the relative cognitive status of U.S. Navy Vietnam-era RPOWs using extant data from the Naval Operational Medicine Institute. Performance on 3 cognitive batteries was compared between RPOWs and a control group. These batteries were the Haistead-Reitan Neuropsychological Battery (HRNB), the Wechsler Adult Intelligence Scale (WMS), and the CogScreen-Aeromedical Edition (AE). The HRNB and WMS were each administered 3 times across 20 years, and the CogScreen-AE was administered once. The few significant differences between the cognitive performance of RPOWs and their matched controls did not indicate evidence of performance decrement for RPOWs on any cognitive measure. Results suggest that this group of RPOWs did not experience cognitive impairment as a result of their experience as POWs.

DTIC

Cognition; Mental Performance; Aerospace Medicine

20040012626 Naval Health Research Center, San Diego, CA

Are Gulf War Veterans Experiencing Illness Due to Exposure to Smoke from Kuwaiti Oil Well Fires? Examination of Department of Defense Hospitalization Data

Smith, T. C.; Heller, J. M.; Hooper, T. I.; Gackstetter, G. D.; Gray, G. C.; Jan. 2001; 13 pp.; In English

Report No.(s): AD-A419051; NHRC-01-08; No Copyright; Avail: CASI; [A03](#), Hardcopy

Context There has been much public and veteran concern over possible toxic exposures and reported symptoms by Gulf

War veterans. Objective To determine if there is an increased risk of postwar morbidity severe enough to warrant hospitalization among those exposed to Kuwaiti oil well fire smoke. Design, Setting, and Participants In this historical cohort study, complete exposure and demographic data were available for 518,87 Gulf War veterans consisting of 87.3% regular active duty and 12.7% Reserve personnel. Main Outcome Measures Using data from all Department of Defense hospitals, Cox modeling was completed for hospitalizations due to any cause, hospitalizations with diagnoses in 15 major categories, and hospitalizations for specific diagnoses thought to be likely manifestations of the exposure. Observation time was calculated from February 2, 1991, until hospitalization, separation from active-duty service, or January 31, 1999, whichever occurred first. Results Exposure to oil well fire smoke particulate matter was determined through the overlay of meteorologic and diffusion modeling data onto troop location data. We constructed 7 exposure groups based on duration and amount of exposure. Among the 25 models, the only model at increased adjusted hospitalization risk was that for diagnoses in the injury and poisoning (RR=1.05; 95% CI, 1.01- 1.11). Conclusions Having some limitations, these data do not support the hypothesis that Gulf War veterans are suffering an increased risk of postwar morbidity from exposure to Kuwaiti oil well fire smoke. DTIC

Signs and Symptoms; Smoke; Injuries

20040012640 NASA Marshall Space Flight Center, Huntsville, AL, USA

Use of Plastic Capillaries for Macromolecular Crystallization

Potter, Rachel R.; Hong, Young-Soo; Ciszak, Ewa M.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Methods of crystallization of biomolecules in plastic capillaries (Nalgene 870 PFA tubing) are presented. These crystallization methods used batch, free-interface liquid-liquid diffusion alone, or a combination with vapor diffusion. Results demonstrated growth of crystals of test proteins such as thaumatin and glucose isomerase, as well as protein studied in our laboratory such dihydrolipoamide dehydrogenase. Once the solutions were loaded in capillaries, they were stored in the tubes in frozen state at cryogenic temperatures until the desired time of activation of crystallization experiments.

Author

Crystallization; Crystal Growth

20040012689 NASA Marshall Space Flight Center, Huntsville, AL, USA

The Thiamin Pyrophosphate-Motif

Dominiak, Paulina M.; Ciszak, Ewa M.; [2003]; 2 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Using databases the authors have identified a common thiamin pyrophosphate (TPP)-motif in the family of functionally diverse TPP-dependent enzymes. This common motif consists of multimeric organization of subunits, two catalytic centers, common amino acid sequence, and specific contacts to provide a flip-flop, or alternate site, mechanism of action. Each catalytic center [PP:PYR] is formed at the interface of the PP-domain binding the magnesium ion, pyrophosphate and aminopyrimidine ring of TPP, and the PYR-domain binding the aminopyrimidine ring of that cofactor. A pair of these catalytic centers constitutes the catalytic core [PP:PYR]* within these enzymes. Analysis of the structural elements of this catalytic core reveals novel definition of the common amino acid sequences, which are GX@&(G)@XXGQ, and GDGX25-30 within the PP- domain, and the E&(G)@XXG@ within the PYR-domain, where Q, corresponds to a hydrophobic amino acid. This TPP-motif provides a novel tool for annotation of TPP-dependent enzymes useful in advancing functional proteomics.

Author

Enzymes; Amino Acids; Catalysts

20040012769 Naval Health Research Center, San Diego, CA

An Assessment of the Potential for Increasing the Salvageability of Critical Combat Traumas Through First Responder Interventions

Blood, Christopher G.; Walker, G. J.; Bias, Ray; Kay, Edmond; Carlson, Edward J.; Jul. 30, 2002; 15 pp.; In English Report No.(s): AD-A419106; NHRC-02-20; No Copyright; Avail: CASI; A03, Hardcopy

Five former first responders with battlefield experience as a corpsman/ medic and subsequent medical experience after discharge each reviewed 100 clinical records of soldiers wounded in combat who subsequently died of their wounds. The former first responders were surveyed as to which, if any, present-day technologies and/or training, if made available to today's first responders, would make a difference in the salvageability of each trauma case reviewed. In an average of 83.8% of the cases, the first responders thought no intervention by a corpsman or medic could make a difference in salvageability; in another 7. 6% of cases it was believed that any difference would be marginal or that the subsequent quality of life would be

questionable. However, in 4.6% of the trauma cases, the first responders indicated that the actions of a present-day corpsman/medic might increase the salvageability of the casualty with the subsequent quality of life expected to be okay. The equipment and supplies most frequently cited to yield gains in salvageability included medical anti-shock trousers, sufficient blood replacement fluids, bag valve masks, and hemorrhage control devices. Training most prominently cited by the first responders as potentially effecting increases in salvageability included endotracheal or chest intubation, advanced trauma life support, and intravenous fluid therapy.

DTIC

Clinical Medicine; Shock Resistance; Medical Personnel

20040012793 Cornell Univ., Ithaca, NY

Direct Effects of Folate Metabolism on Gene Expression in Metastatic Breast Cancer

Calero, Monica; Collins, Ruth N.; Jul. 2003; 62 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0218

Report No.(s): AD-A419141; No Copyright; Avail: CASI; [A04](#), Hardcopy

Ab proteins are small GTPases that are essential elements of the protein transport machinery of eukaryotic cells. Each round of membrane transport requires a cycle of Rab protein nucleotide binding and hydrolysis. Ny research project consists in the study of Rab GTPases, the way in which they regulate intracellular transport, and the elucidation of mechanisms by which proteins involved in intracellular protein trafficking are linked to uncontrolled cellular proliferation and cancer. Our laboratory has extensively characterized Yiplp, membrane proteins which appear to play a role in Rab-mediated membrane transport in *Saccharomyces cerevisiae*. The major accomplishment this final year was the elucidation of the importance of the prenylation on the activity and localization of Rab GTPases. The results will be discussed in terms of the relevance to treatment for human cancers.

DTIC

Cancer; Mammary Glands; Metastasis; Nucleotides

20040012797 Harvard Medical School, Boston, MA

Kinase Independent Functions of Cyclin D1 Which Contribute to its Oncogenic Potential In Vivo

Landis, Mark W.; Hinds, Philip W.; Jul. 2003; 19 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0279

Report No.(s): AD-A419146; No Copyright; Avail: CASI; [A03](#), Hardcopy

Cyclin D1, an important cell cycle regulator, is a potent oncogene in several tumor types, including breast cancer. The most well understood function of cyclin D1 is to bind and activate cdks 4 and 6. One target of these kinases is pRb. Upon phosphorylation, pRb is inactivated, and cells pass from G1 into S phase. We and others have demonstrated that cyclin D1 has other functions, many of which are independent of kinase activity in vitro. In vivo demonstration of kinase independent functions of cyclin D1 may help elucidate the underlying mechanisms of cyclin D1 oncogenicity. To determine whether cyclin D1 has important kinase-independent functions in vivo, we are generating a cyclin D1 K112E knock-in mouse. This single base change results in a cyclin that can bind to, but not activate the kinase partner. As the locus will be left almost undisturbed, we expect that the mutant allele will be expressed in a normal manner. The phenotype of the mouse will be analyzed to determine whether any of the phenotypes of the cyclin D1 *-/-* mouse are rescued. This analysis will allow dissection of how the kinase-independent functions of cyclin D1 contribute to development, proliferation and oncogenesis in vivo.

DTIC

Cancer; Carcinogens; Phosphorylation

20040012800 University of Southern California, Los Angeles, CA

Improving Retroviral Vectors for Gene Therapy of Prostate Cancer

Kasahara, Noriyuki; Aug. 2003; 30 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0044

Report No.(s): AD-A419147; No Copyright; Avail: CASI; [A03](#), Hardcopy

This project aims to increase the transduction efficiency and target cell-specificity of retroviral vectors, thereby improving gene transfer to prostate cancer cells. We have developed a novel replication-competent retroviral (RCR) vector system for gene transfer to solid tumors which is highly efficient, as each tumor cell which is successfully transduced becomes itself a virus-producing cell and initiates further infection events even after the initial injection. Through this project, we have tested a number of strategies for targeting these replicating vectors specifically and exclusively to tumor cells in order to limit and

control the replicative process and minimize the risk to normal cells. We have engineered the prostate-specific probasin promoter into the retroviral long terminal repeat (LTR), and used this construct to establish producer cell lines derived from prostate cancer cells that express androgen receptors. We have optimized the design of the probasin/LTR hybrid promoter construct, and we have demonstrated the prostate-specificity of probasin-targeted RCR vector - replication and suicide gene transfer in culture and in vivo.

DTIC

Genes; Infectious Diseases; Prostate Gland; Design Analysis

20040012801 California Univ., Berkeley, CA

Cooperative Interactions During Human Mammary Epithelial Cell Immortalization

Yaswen, Paul; Jul. 2003; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0443

Report No.(s): AD-A419150; No Copyright; Avail: CASI; [A03](#), Hardcopy

Our laboratory has pioneered the development and use of cultured human mammary epithelial cells (HMEC) to gain information on the defects in growth control processes that allow finite lifespan HMEC to overcome all senescence barriers, reactivate telomerase, and gain immortal potential. We hypothesize that, due to the stringency of telomerase repression in humans, attaining these defects may be a key rate-limiting step in human carcinogenesis. The goal of this project has been to define the minimum number of genetic and epigenetic changes that permit telomerase reactivation and immortal transformation of finite lifespan HMEC, in a manner that models changes observed in breast cancers in vivo. During the past year, we were able to obtain immortalized HMEC using a combination of two oncogenes (c-myc and ZNF217) with pathological relevance to human breast cancer. Comparative genomic hybridization (CGH) analyses of two immortal populations obtained using c-myc and ZNF217 did not show any detectable additional changes in gene copy numbers, suggesting that along with unknown epigenetic changes, over-expression of these 2 genes together might be sufficient for immortalization. Better understanding of the underlying molecular changes involved in telomerase reactivation may provide novel prevention strategies and/or targets for therapeutic intervention in breast cancer pathogenesis.

DTIC

Cancer; Mammary Glands; Genetics

20040012806 South Carolina Univ., Columbia, SC

Quasi-Pro prospective Study of Breast Cancer and Diet

Hebert, James R.; Aug. 2003; 49 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0327

Report No.(s): AD-A419355; No Copyright; Avail: CASI; [A03](#), Hardcopy

Conventional breast cancer (BrCA) risk factors explain 50% of variability in disease rates and change in incidence over time. The past two generations of American women have experienced major changes in physical activity, preparing and eating food, and increases in the prevalence of overweight. These factors may exert powerful influences on physiologic processes leading to cancer. This case control study aims to investigate the relationship between physical activity, diet, and adult weight history and breast cancer. Our goal is to recruit 648 incident cases of breast cancer and up to 2 controls per case from the Breast Care Centers of the Palmetto Richland and Baptist Hospitals of Palmetto Health - /South Carolina Cancer Center (BCC) - services that see a total of about 35,000 mammography screens each year and in which about 700 women are diagnosed with breast cancer. After obtaining permission from the Human Use Review Office of the USAMRAA (on 30 November 2000) to begin recruitment we finished the run-in process and began recruitment in the Baptist Hospital BCC in spring of 2001. To-date, we have recruited 990 subjects. Recruitment at Richland began in May 2002.

DTIC

Cancer; Diets; Diseases

20040012807 Thomas Jefferson Univ., Philadelphia, PA

Molecular Characterization of Squamous Cell Carcinomas Derived From Recessive Dystrophic Epidermolysis Bullosa

Mahoney, My G.; Rodeck, Ulrich; Uitto, Jouni; Jun. 2003; 17 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0215

Report No.(s): AD-A419358; No Copyright; Avail: CASI; [A03](#), Hardcopy

Patients with recessive dystrophic epidermolysis bullosa (RDEB) frequently present with squamous cell carcinomas (SCCs) probably as a result of chronic blistering and extensive scarring. These tumors are clinically aggressive as they

metastasize readily. The metastasis-associated protein (MTA)-1, a transcription suppressor, is overexpressed in several epithelial neoplasms including SCCs. Our preliminary results demonstrate that MTA1 expression is induced by activation of the epidermal growth factor receptor (EGFR). As deregulation of EGFR signaling is frequently observed in aggressive epithelial neoplasms we propose to study the role of EGFR signaling and MTA1 expression in SCCs derived in RDEB patients. Our Specific Aims are to establish cell lines derived from SCCs in non-RDEB and RDEB patients, characterize the malignant phenotype of these cells as it relates to EGFR expression and signaling and to expression of MTA1, examine the contribution of EGFR/MTA1 to proliferation, invasiveness, and cell survival and identify EGFR-dependent signaling pathways contributing to MTA1 expression in these cells. The results from this research will provide invaluable tools for future analysis of the pathobiology of carcinoma cells and will ascertain whether EGFR/MTA1 signaling pathways contributes significantly to the metastasis and invasiveness of SCC derived from RDEB patients.

DTIC

Cancer; Metastasis; Neoplasms; Suppressors

20040012938 Henry Ford Health System, Detroit, MI, USA

Understanding Racial Disparities in Mammography Use Among Breast Cancer Survivors

Lafata, Jennifer E.; Jul. 2003; 67 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0531

Report No.(s): AD-A419143; No Copyright; Avail: CASI; [A04](#), Hardcopy

Despite general consensus that breast cancer (BC) survivors should undergo annual mammography, findings indicate over 1 in 7 women fail to receive a mammogram within 2 years of BC treatment, and that African Americans are almost half as likely to participate in mammography screening as Caucasians. To develop and pilot test a survey instrument to understand what factors influence a BC survivor's decision to receive mammography and whether differences exist in these factors by patient race. Methods: Using information from the literature and focus groups (two each among African American and Caucasian BC survivors), we developed a mailed patient survey, which was mailed to African American and Caucasian BC survivors. Results were analyzed to identify the beliefs, social influences, and preferences for mammography screening attributes. Results: Overall, general trends showed that test accuracy, friendliness of staff, and ease of appointment scheduling were important attributes to mammogram screening use. Although the low response rates among non-users precluded us from comprehensively evaluating racial differences in the factors associated with mammogram use following BC treatment, the results provide promising preliminary data. Future research will continue investigations into understanding the mammography use decision making process and how this process differs by race. A primary consideration will also be how to improve research participation rates among non-users.

DTIC

Cancer; Mammary Glands

20040012939 Northwestern Univ., Chicago, IL, USA

Expression of Transforming Growth Factor-Beta (TGF- Beta) in Prostate Cancer Progression

Lee, Chung; Sep. 2003; 27 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9009

Report No.(s): AD-A419151; No Copyright; Avail: CASI; [A03](#), Hardcopy

We have changed from using rats to mice. This change was approved by the DOD review committee. Our hypothesis is that if we render the host immune cells insensitive to TGF-beta, these immune cells would be able to eradicate tumor cells. There are three tasks. Task 1 was to establish a dominant negative TGF-beta type II receptor bearing bone marrow cells, using GFP as a selectable marker. Task 2 was to test the role of TGF-beta insensitivity in immune cell development and differentiation. Task 3 was to assess the anti-tumor activity in host animals bearing TGF- beta insensitive bone marrow cells.

DTIC

Neoplasms; Prostate Gland; Bone Marrow

20040012952 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Working Toward a Healthy Planet

Maynard, Nancy G.; [2003]; 1 pp.; In English; AMS Conference on Broadcast Meteorology, 10-12 Aug. 2003, Seattle, WA, USA; No Copyright; Avail: Other Sources; Abstract Only

Using information from NASA's Earth Science Public Health Applications Program, Dr. Maynard will address how remote sensing data and associated technologies can be used toward a better understanding of the links among human health,

the environment and weather/climate - and, how this increased understanding plus improved information sharing can empower local health and environmental decision-makers to better predict climate-related health problems, take preventive measures, and improve response actions. Remotely-sensed data and observations are providing powerful new tools for addressing climate and environment-related human health problems through increased capabilities for monitoring and surveillance of parameters useful to such problems as infectious and vector-borne diseases, air and water quality, harmful algal blooms, UV radiation, contaminant and pathogen transport in air and water, and thermal stress. NASA's multi-disciplinary scientific team is demonstrating how satellites from their unique vantage point in space can serve as sentinels for weather, climate, and health problems through studies on asthma, malaria, Rift Valley Fever, Asian and African dust, and West Nile Virus

Author

Climate; Contaminants; Dust; Earth Sciences; Health; Public Health; Remote Sensing; Radiation Transport; Ultraviolet Radiation

52

AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20040010452 Swedish Defence Research Establishment, Stockholm, Sweden

Measurements on Spatial Disorientation during Gondola Centrifugation

Tribukait, A.; Eiken, O.; Dec. 2002; 36 pp.; In Swedish

Report No.(s): PB2004-101274; FOI-R-0747-SE; Copyright; Avail: National Technical Information Service (NTIS)

Spatial disorientation was studied in a gondola centrifuge. Method: The subjective visual horizontal (SVH) was measured in (I) seven subjects at 1g, 1.1G, 1.7G, and 2.5G, and (II) at 2.5G in eleven subjects with the head rotated 20 degrees to the right or left and after yaw head movements.

NTIS

Disorientation; Centrifuges; Illusions

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20040010358 NASA Ames Research Center, Moffett Field, CA, USA

Equivalent Mass versus Life Cycle Cost for Life Support Technology Selection

Jones, Harry; [2003]; 1 pp.; In English; 33rd International Conference on Environmental Systems: Metrics and Milestones for R and D Pertaining to the President's Management Agenda, 7-10 Jul. 2003, Vancouver, British Columbia, Canada; No Copyright; Avail: Other Sources; Abstract Only

The decision to develop a particular life support technology or to select it for flight usually depends on the cost to develop and fly it. Other criteria - performance, safety, reliability, crew time, and risk - are considered, but cost is always an important factor. Because launch cost accounts for most of the cost of planetary missions, and because launch cost is directly proportional to the mass launched, equivalent mass has been used instead of cost to select life support technology. The equivalent mass of a life support system includes the estimated masses of the hardware and of the pressurized volume, power supply, and cooling system that the hardware requires. The equivalent mass is defined as the total payload launch mass needed to provide and support the system. An extension of equivalent mass, Equivalent System Mass (ESM), has been established for use in Advanced Life Support. A crew time mass-equivalent and sometimes other non-mass factors are added to equivalent mass to create ESM. Equivalent mass is an estimate of the launch cost only. For earth orbit rather than planetary missions, the launch cost is usually exceeded by the cost of Design, Development, Test, and Evaluation (DDT&E). Equivalent mass is used only in life support analysis. Life Cycle Cost (LCC) is much more commonly used. LCC includes DDT&E, launch, and operations costs. Since LCC includes launch cost, it is always a more accurate cost estimator than equivalent mass. The relative costs of development, launch, and operations vary depending on the mission design, destination, and duration. Since DDT&E or operations may cost more than launch, LCC may give a more accurate cost ranking than equivalent mass. To be

sure of identifying the lowest cost technology for a particular mission, we should use LCC rather than equivalent mass.

Author

Life Cycle Costs; Life Support Systems; Payloads; Spacecraft Launching; Technology Utilization

20040010463 Swedish Defence Research Establishment, Linköping, Sweden

Development of an Instrument for Measuring Team Performance Potential

Andersson, J.; Berggren, P.; Castor, M.; Magnusson, S.; Svensson, E.; May 2002; 28 pp.; In Swedish

Report No.(s): PB2004-101528; FOI-R-0429-SE; Copyright; Avail: National Technical Information Service (NTIS)

There has been a growing interest for studies of group and teams within the research field Human Factors during the last decade. The body of hypotheses and ideas about the team, and especially aspects affecting team performance, is quite extensive. One aspect that is often discussed is that of common ground or shared mental models. However, instrument to capture these aspects are not yet developed. This report is one step towards a solution of that problem. The first part of the report discusses the theoretical underpinnings used, especially psycholinguistic theories. It is further argued that the concept contains at least two important dimensions (calibration and overlap). The presentation of the concept and its dimensions is followed by an example that provides procedure for a future study. The report also describes how to score and analyze collected data. Finally, the report ends with a discussion about the context and prerequisites that are needed for the instrument to function optimally.

NTIS

Human Performance; Human Factors Engineering; Psycholinguistics

20040010641 Army Research Lab., Aberdeen Proving Ground, MD

Quick Assessment of the Navy Mark V CBR Respirator After 13 Years in Storage

Felling, Ryan J.; Cherry, Gregory A.; Weiss, Ronald A.; Sep. 2003; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418785; ARL-TR-3069; No Copyright; Avail: CASI; [A03](#), Hardcopy

This study was a quick assessment of the Mark V CBR respirator for its fit factor and physiological effectiveness using two volunteer subjects. The assessment included tests for fit factor, vision, and carbon dioxide buildup during exercise. Having been manufactured in 1984, the ability of the respirator to provide adequate nuclear, biological, and chemical and hazardous materials protection for civil authorities was questionable. Three of these respirators still in their original packages were supplied for testing. The assessment indicated that the masks should be discarded or used only for training.

DTIC

Respirators; Evaluation

20040012725 NASA Ames Research Center, Moffett Field, CA, USA

Design Rules for Life Support Systems

Jones, Harry; [2002]; 15 pp.; In English; 33rd International Conference on Environmental Systems: Advanced Life Support and Systems Analysis I, 7-10 Jul. 2003, Vancouver, British Columbia, Canada; Original contains black and white illustrations

Report No.(s): SAE-2003-01-2356; No Copyright; Avail: CASI; [A03](#), Hardcopy

This paper considers some of the common assumptions and engineering rules of thumb used in life support system design. One general design rule is that the longer the mission, the more the life support system should use recycling and regenerable technologies. A more specific rule is that, if the system grows more than half the food, the food plants will supply all the oxygen needed for the crew life support. There are many such design rules that help in planning the analysis of life support systems and in checking results. These rules are typically if-then statements describing the results of steady-state, 'back of the envelope,' mass flow calculations. They are useful in identifying plausible candidate life support system designs and in rough allocations between resupply and resource recovery. Life support system designers should always review the design rules and make quick steady state calculations before doing detailed design and dynamic simulation. This paper develops the basis for the different assumptions and design rules and discusses how they should be used. We start top-down, with the highest level requirement to sustain human beings in a closed environment off Earth. We consider the crew needs for air, water, and food. We then discuss atmosphere leakage and recycling losses. The needs to support the crew and to make up losses define the fundamental life support system requirements. We consider the trade-offs between resupplying and recycling oxygen, water, and food. The specific choices between resupply and recycling are determined by mission duration, presence of in-situ resources, etc., and are defining parameters of life support system design.

Author

Life Support Systems; Systems Engineering; NASA Space Programs; Spacecraft Environments

55 EXO BIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20040010562 Triton Coll., River Grove, IL, USA

Possible Life in a European Ocean

Cole, Kevin J.; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Europa's smooth surface has been attributed to a resurfacing mechanism (such as geysers or cryovolcanics), possibly associated with a subsurface ocean. If an European ocean has existed for a geologically extended period, then a viable ecosystem may have evolved. If so, evolution may have produced marine fauna with some traits similar to those species found in the deepest abyss of Earth's ocean realm.

Derived from text

Europa; Extraterrestrial Life

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20040008588 Swedish Defence Research Establishment, Linköping

Aerosol Attenuation Model for Scandinavian Environment: Based on Measurements at Loevsætt in Uppland

Persson, R.; Kaurila, T.; Dec. 2002; In Swedish

Report No.(s): PB2004-100952; FOI-R-0689-SE; Copyright; Avail: National Technical Information Service (NTIS)

The atmosphere affects the propagation of optical radiation by different ways. This influences the performance of ElectroOptical systems. FOI, earlier FOA, as carried out aerosol during many years in order to characterize Swedish conditions. The reason was that IR transmission models (mostly American) underestimated the IR attenuation compared to IR measurements. Results from a multi channel transmissometer OLA (Optical Link in the Atmosphere); have also been used to build an aerosol model earlier. However, there are reasons to check alternate models, for one thing to simplify the previous models and that further measurements have been done. Two simple models to approximate aerosol extinction coefficient have been described in this report. The models estimate from the weather parameters visibility, temperature, and wind speed. Transmission which was approximated by the models has also been compared with transmission calculated with the MODTRAN model for different weather situations. One conclusion drawn from the analysis results shows that there are a larger amount of coarse aerosol particles at the measurement site, than the size distribution used in MODTRAN proposes. In general the Maritime model in MODTRAN seems to give a reasonable good result in the visible and IR wavelengths up to about 4 μm . However, at longer wavelengths also the Maritime model underestimates the aerosol attenuation with a factor of 2-4 at 10 (micro)m.

NTIS

Aerosols; Atmospheric Attenuation; Optical Equipment; Atmospheric Models; Radiation Spectra

20040008593 Newcastle-upon-Tyne Univ., Newcastle

Contract Representation for Run-Time Monitoring and Enforcement

Molina-Jimenez, C.; Shrivastava, S.; Solaiman, E.; Warne, J.; Jul. 2003; 18 pp.

Report No.(s): PB2004-101933; CS-TR-810; Copyright; Avail: National Technical Information Service (NTIS)

Converting a conventional contract into an electronic equivalent that can be executed and enforced by computers is a challenging task. The difficulties are caused by the ambiguities that the original human-oriented text is likely to contain. The conversion process involves the conversion of the original text into mathematical notation. This paper discusses how standard conventional contracts can be described by means of Finite State Machines (FSMs). This mathematical description helps eliminate ambiguities from the original text before the contract is coded into a computer program. The paper describes how to map the rights and obligations extracted from the clauses of the contract into the states, transition and output functions, and input and output symbols of a FSM. The FSM representation can be used to guarantee that the clauses stipulated in the contract

are observed when the contract is executed. The paper describes the middleware required for the enactment of the contract represented as a FSM.

NTIS

Contracts; Conversion; Run Time (Computers); Input/Output Routines; Electronic Mail; Monitors

20040008594 Newcastle-upon-Tyne Univ., Newcastle

Model Checking Correctness Properties of Electronic Contracts

Solaiman, E.; Molina-Jimenez, C.; Shrivastava, S.; Jul. 2003; 20 pp.

Report No.(s): PB2004-101934; CS-TR-811; Copyright; Avail: National Technical Information Service (NTIS)

Converting a conventional contract into an electronic equivalent is not trivial. The difficulties are caused by the ambiguities that the original human-oriented text is likely to contain. In order to detect and remove these ambiguities the contract needs to be described in a mathematically precise notation before the description can be subjected to rigorous analysis. This paper identifies and discusses a list of correctness requirements that a typical executable business contract should satisfy. Next the paper shows how relevant parts of standard conventional contracts can be described by means of Finite State Machines (FSMs). Such a description can then be subjected to model checking. The paper demonstrates this using Promela language and the Spin validator.

NTIS

Conversion; Electronic Mail; Performance Tests; Models

20040008596 Newcastle-upon-Tyne Univ., Newcastle

Logic Synthesis Avoiding State Space Explosion

Khomenko, V.; Koutny, M.; Yakovlev, A.; Aug. 2003; 24 pp.

Report No.(s): PB2004-101936; CS-TR-813; Copyright; Avail: National Technical Information Service (NTIS)

The behaviour of asynchronous circuits is often described by Signal Transition Graphs (STGs), which are Petri nets whose transitions are interpreted as rising and falling edges of signals. One of the crucial problems in the synthesis of such circuits is deriving equations for logic gates implementing each output signal of the circuit. This is usually done using reachability graphs. In this paper, we avoid constructing the reachability graph of an STG, which can lead to state space explosion, and instead use only the information about causality and structural conflicts between the events involved in a finite and complete prefix of its unfolding. We propose an efficient algorithm for logic synthesis based on the Incremental Boolean Satisfiability (SAT) approach. Following the description of our method, we present some problem-specific optimization rules. Experimental results show that this technique leads not only to huge memory savings when compared with the methods based on reachability graphs, but also to significant speedups in many cases.

NTIS

Petri Nets; Analysis (Mathematics); Logic; Synchronism; Gates (Circuits)

20040010328 George Washington Univ., Washington, DC, USA

Experimental Evaluation and Workload Characterization for High-Performance Computer Architectures

El-Ghazawi, Tarek A.; [1995]; 69 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-34; No Copyright; Avail: CASI; A04, Hardcopy

This research is conducted in the context of the Joint NSF/NASA Initiative on Evaluation (JNNIE). JNNIE is an inter-agency research program that goes beyond typical benchmarking to provide and in-depth evaluations and understanding of the factors that limit the scalability of high-performance computing systems. Many NSF and NASA centers have participated in the effort. Our research effort was an integral part of implementing JNNIE in the NASA ESS grand challenge applications context. Our research work under this program was composed of three distinct, but related activities. They include the evaluation of NASA ESS high-performance computing testbeds using the wavelet decomposition application; evaluation of NASA ESS testbeds using astrophysical simulation applications; and developing an experimental model for workload characterization for understanding workload requirements. In this report, we provide a summary of findings that covers all three parts, a list of the publications that resulted from this effort, and three appendices with the details of each of the studies using a key publication developed under the respective work.

Author

Architecture (Computers); Characterization; Research and Development; Parallel Processing (Computers); Workloads (Psychophysiology)

20040010434 Tennessee Univ., Knoxville, TN, USA, California Inst. of Tech., Pasadena, CA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

High Performance Computing Clusters, Constellations, MPPs, and Future Directions

Dongarra, J.; Sterling, T.; Simon, H.; Strohmaier, E.; Jun. 10, 2003; 20 pp.; In English

Report No.(s): DE2003-813392; No Copyright; Avail: Department of Energy Information Bridge

Last years paper by Bell and Gray examined past trends in high performance computing and asserted likely future directions based on market forces. While many of the insights drawn from this perspective have merit and suggest elements governing likely future directions for HPC, there are a number of points put forth that we feel require further discussion and, in certain cases, suggest alternative, more likely views. One area of concern relates to the nature and use of key terms to describe and distinguish among classes of high end computing systems, in particular the authors use of cluster to relate to essentially all parallel computers derived through the integration of replicated components. The taxonomy implicit in their previous paper, while arguable and supported by some elements of our community, fails to provide the essential semantic discrimination critical to the effectiveness of descriptive terms as tools in managing the conceptual space of consideration. In this paper, we present a perspective that retains the descriptive richness while providing a unifying framework. A second area of discourse that calls for additional commentary is the likely future path of system evolution that will lead to effective and affordable Petaflops-scale computing including the future role of computer centers as facilities for supporting high performance computing environments. This paper addresses the key issues of taxonomy, future directions towards Petaflops computing, and the important role of computer centers in the 21st century.

NTIS

Constellations; Parallel Computers

20040010446 Helsinki Univ. of Technology, Espoo, Finland

Closed Form Solutions of Maxwell's Equations in the Computer Age

Olyslager, F.; Lindell, I. V.; Mar. 2003; 24 pp.

Report No.(s): PB2004-101243; REPT-407; Copyright; Avail: National Technical Information Service (NTIS)

We will consider four closed form solutions of Maxwell's equations that have been derived or were revisited during the past decade. First we will focus on two problems from electrostatics: the electrostatic image for the dielectric sphere and a generalization of the Thompson and Lampard capacitor. Then we will give two solutions of the full Maxwell equations in time-harmonic regime: the Green dyadics for a homogeneous bianisotropic medium with similar medium dyadics and the scattering of a plane wave at a diaphanous wedge. Although we have studied these problems with some rigor in the past we will, in each case, present here a new, shorter and more direct solution.

NTIS

Capacitors; Electromagnetism; Mathematical Models

20040010450 Swedish Defence Research Establishment, Linköping, Sweden

Proposed Taxonomy of Software Weapons

Karresand, M.; Jun. 2002; 160 pp.

Report No.(s): PB2004-101270; FOI-R-0840-SE; Copyright; Avail: National Technical Information Service (NTIS)

The terms and classification schemes used in the computer security field today are not standardized. Thus the field is hard to take in, there is a risk of misunderstandings, and there is a risk the scientific work is being hampered. Therefore this report presents a proposal for taxonomy of software based IT weapons. After an account of the theories governing the formation of taxonomy, and a presentation of the requisites, seven taxonomies from different parts of the computer security field are evaluated. Then the proposed new taxonomy is introduced and the inclusion of each of the 15 categories are motivated and discussed.

NTIS

Computer Information Security; Taxonomy

20040010466 Swedish Defence Research Establishment, Stockholm, Sweden

Annual Report 2002 on FOI:s Research on Modelling and Simulation

Sporre, L.; Jan. 2003; 36 pp.; In Swedish

Report No.(s): PB2004-101536; FOI-R-0774-SE; Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes the research from the fiscal year 2002 within the Swedish Defense Research Agency in the domain of Modeling and Simulation. In the report you will find a summing-up of the aim and direction of the research domain

and the national and international development. The results of the research are summarized and the activities in each project are described. FOI research into MoS is aimed at supporting the Swedish Armed Forces by developing and assessing technologies, methodologies and tools to be used in a range of modeling and simulation applications.

NTIS

Computerized Simulation; Research Projects; Simulation; Armed Forces

20040010501 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Simulation-Based Study of High Speed TCP and its Deployment

de Souza, E.; May 2003; In English

Report No.(s): DE2003-813586; LBNL-52549; No Copyright; Avail: National Technical Information Service (NTIS)

The current congestion control mechanism used in TCP has difficulty reaching full utilization on high speed links, particularly on wide-area connections. For example, the packet drop rate needed to fill a Gigabit pipe using the present TCP protocol is below the currently achievable fiber optic error rates. HighSpeed TCP was recently proposed as a modification of TCP's congestion control mechanism to allow it to achieve reasonable performance in high speed wide-area links. In this research, simulation results showing the performance of HighSpeed TCP and the impact of its use on the present implementation of TCP are presented. Network conditions including different degrees of congestion, different levels of loss rate, different degrees of bursty traffic and two distinct router queue management policies were simulated. The performance and fairness of HighSpeed TCP were compared to the existing TCP and solutions for bulk-data transfer using parallel streams.

NTIS

Computerized Simulation; Computer Networks; Data Transmission

20040010702 General Accounting Office, Washington, DC

Management Planning Guide for Information Systems Security Auditing

Dec. 10, 2001; 70 pp.

Report No.(s): PB2004-102423; No Copyright; Avail: CASI; [A04](#), Hardcopy

To be effective in ensuring accountability, auditors must be able to evaluate information systems security and offer recommendations for reducing security risks to an acceptable level. To do so, they must possess the appropriate resources and skills. This guide is intended to help audit organizations respond to this expanding use of IT and the concomitant risks that flow from such pervasive use by governments. It applies to any evaluative government organization, regardless of size or current methodology. Directed primarily at executives and senior managers, the guide covers the steps involved in establishing or enhancing an information security auditing capability: planning, developing a strategy, implementing the capability, and assessing results.

NTIS

Computer Information Security; Management Planning

20040010773 NASA Ames Research Center, Moffett Field, CA, USA

Plan-graph Based Heuristics for Conformant Probabilistic Planning

Ramakrishnan, Suresh; Pollack, Martha E.; Smith, David E.; [2004]; 7 pp.; In English; International Conference on Automated Planning and Scheduling, 2004, USA; Copyright; Avail: CASI; [A02](#), Hardcopy

In this paper, we introduce plan-graph based heuristics to solve a variation of the conformant probabilistic planning (CPP) problem. In many real-world problems, it is the case that the sensors are unreliable or take too many resources to provide knowledge about the environment. These domains are better modeled as conformant planning problems. POMDP based techniques are currently the most successful approach for solving CPP but have the limitation of state- space explosion. Recent advances in deterministic and conformant planning have shown that plan-graphs can be used to enhance the performance significantly. We show that this enhancement can also be translated to CPP. We describe our process for developing the plan-graph heuristics and estimating the probability of a partial plan. We compare the performance of our planner PVHPOP when used with different heuristics. We also perform a comparison with a POMDP solver to show over a order of magnitude improvement in performance.

Author

Heuristic Methods; Probability Theory; Algorithms; Graph Theory; Planning

20040010791 NASA Ames Research Center, Moffett Field, CA, USA

Hybrid Discrete-Continuous Markov Decision Processes

Feng, Zhengzhu; Dearden, Richard; Meuleau, Nicholas; Washington, Rich; [2003]; 8 pp.; In English; 14th International

Conference on Automated Planning and Scheduling, 3-7 Jun. 2004, Whistler, British Columbia, Canada; Copyright; Avail: CASI; [A02](#), Hardcopy

This paper proposes a Markov decision process (MDP) model that features both discrete and continuous state variables. We extend previous work by Boyan and Littman on the mono-dimensional time-dependent MDP to multiple dimensions. We present the principle of lazy discretization, and piecewise constant and linear approximations of the model. Having to deal with several continuous dimensions raises several new problems that require new solutions. In the (piecewise) linear case, we use techniques from partially-observable MDPs (POMDPs) to represent value functions as sets of linear functions attached to different partitions of the state space.

Author

Markov Processes; Mathematical Models; Discrete Functions; Decision Theory; Approximation

20040012873 Stanford Linear Accelerator Center, Stanford, CA, USA

WIRED: World-Wide Web Interactive Remote Event Display

2003; 12 pp.; In English

Report No.(s): DE2003-813086; SLAC-PUB-9786; No Copyright; Avail: Department of Energy Information Bridge

WIRED (World-Wide Web Interactive Remote Event Display) is a framework, written in the Java (trademark) language, for building High Energy Physics event displays. An event display based on the WIRED framework enables users of a HEP collaboration to visualize and analyze events remotely using ordinary WWW browsers, on any type of machine. In addition, event displays using WIRED may provide the general public with access to the research of high energy physics.

NTIS

High Energy Interactions; Display Devices

20040012876 Stanford Linear Accelerator Center, Stanford, CA, USA

Internet Performance and Reliability Measurements

2003; 12 pp.; In English

Report No.(s): DE2003-813085; SLAC-PUB-9785; No Copyright; Avail: Department of Energy Information Bridge

Collaborative HEP research is dependent on good Internet connectivity. Although most local- and wide-area networks are carefully watched, there is little monitoring of connections that cross many networks. This paper describes work in progress at several sites to monitor Internet end-to-end performance between hundreds of HEP sites worldwide. At each collection site, ICMP ping packets are automatically sent periodically to sites of interest. The data is recorded and made available to analysis nodes, which collect the data from multiple collection sites and provide analysis and graphing. Future work includes improving the efficiency and accuracy of ping data collection.

NTIS

Local Area Networks; Computer Networks; Data Processing

60

COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20040008660 Illinois Univ., Champaign, IL, USA

High-Performance Input/Output Systems for Parallel Computers

Reed, Daniel A.; March 31, 1997; 16 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA/5555-22/NASA; No Copyright; Avail: CASI; [A03](#), Hardcopy

During the past three and one half years, our research has focused on three areas: (a) the performance analysis and optimization of input/output intensive NASA applications and parallel file systems, (b) PPFS (portable parallel file system) development, ports and optimizations, and (c) exploration of policies for adaptive, performance-directed file caching and migration. These efforts were driven by data from performance characterizations of applications based on the NCSA/EOSDIS HDF library, code from the NASA Goddard SeaWiFS project, and code from the NOAA/NASA Pathfinder AVHRR (Advanced Very High Resolution Radiometer) project. As a prelude to input/output analysis, we first extended our Pablo performance instrumentation and analysis toolkit to support capture and processing of input/output data. We then instrumented and analyzed the input/output behavior of both the HDF library and the NASA codes. Using insights gained from this analysis, we were able substantially increase the performance of the HDF library and the Pathfinder and SeaWiFS codes by

automatically classifying file access patterns. In addition, we have begun implementation of a complementary sensor/actuator model for performance-directed adaptive control of our portable parallel file system (PPFS). The remainder of this report is organized as follows. First, in (2), we describe our input/output characterization infrastructure and experiences characterizing file access patterns. Using the extended PPFS infrastructure described in (3), (4) describes our experiences with automatic classification of access patterns and the performance improvements that accrue when file policies are selected based on access pattern classification. In \$5, we also describe our ongoing implementation of an infrastructure for performance-directed adaptive control of file system policies. Finally, \$6 describes efforts in related input/output projects that buttress and augment the work supported by this contract.

Derived from text

Input/Output Routines; Parallel Computers; Performance Tests; Reliability Analysis; Eos Data and Information System

20040012885 Georgia Tech Research Inst., Atlanta, GA, USA

Compiler Optimizations for Power-Aware Computing. Volume 2 of 2

Mooney, Vincent J., III; Sep. 2003; 101 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-00-2-0654; DARPA ORDER-J870; Proj-HPSW

Report No.(s): AD-A418764; AFRL-IF-RS-TR-2003-220-VOL-2; No Copyright; Avail: CASI; [A06](#), Hardcopy

This final report summarizes work done on the DARPA funded project 'Compiler Optimizations for Power Aware Computing.' Volume I addresses methodologies invented that can be categorized as software based approaches, hardware based approaches and combined software/hardware based approaches. One of the software based approaches, data remapping, showed a 3.1X energy*delay reduction on a realistic example. One of the hardware based approaches, frequency/voltage scaling of second-level memory, showed a 1.3X energy*delay reduction on a realistic example. A combination of data remapping and frequency/ voltage scaling of second level memory showed a 2. 6X reduction in energy*delay but also showed the lowest power (energy/time) of any of the approaches considered. Volume II addresses realization of the world's first Wearable Motherboard or an intelligent garment for the 21st Century. The motherboard provides an extremely versatile framework for the incorporation of sensing, monitoring, and information processing devices.

DTIC

Computer Programs; Data Processing; Compilers

20040012992 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Commodity Cluster Computing for Remote Sensing Applications using Red Hat LINUX

Dorband, John; [2003]; 1 pp.; In English; X Spanish Conference on Remote Sensing, 17-19 Sep. 2003, Caceres, Spain; No Copyright; Avail: Other Sources; Abstract Only

Since 1994, we have been doing research at Goddard Space Flight Center on implementing a wide variety of applications on commodity based computing clusters. This talk is about these clusters and how they are used on these applications including ones for remote sensing.

Author

Commodities; Cluster Analysis; Computation

61

COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20040008562 Texas Univ., Arlington, TX, USA

A Publish/Subscribe Based Architecture of an Alert Server to Support Prioritized and Persistent Alerts

Chakravarthy, S.; Vontela, N.; Sep. 2003; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-01-2-0543; Proj-R427

Report No.(s): AD-A418706; AFRL-IF-RS-TR-2003-217; No Copyright; Avail: CASI; [A03](#), Hardcopy

This report discusses various architectures and implementation issues and discusses our approach for a publish/subscribe based distributed alert server (SPAWAR application) whose requirements include: priority-based delivery, persistence, recovery, time-to-live and various other features. The approach described in this report provides a lightweight implementation that is general-purpose and can be used for a number of applications. A new efficient sweeping algorithm is used to make sure alerts are delivered correctly and satisfy several requirements such as priority, sending existing alerts to new subscribers, and

regular expression based subscription. The approach was motivated by a need to provide alert distribution capability based on various needs, such as multiple ways to publish (using TAG, USER, and PROFILE), guaranteed delivery of alerts, asynchronous delivery and ack/receipt distribution. This approach is compared with various alternatives. The sweeping algorithm for priority- based delivery is described in detail.

DTIC

Software Engineering; Warning Systems; Client Server Systems

20040008639 Ohio State Univ., Columbus, OH, USA

A Scalability Model for ECS's Data Server

Menasce, Daniel A.; Singhal, Mukesh; [1998]; 19 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-72-56; No Copyright; Avail: CASI; [A03](#), Hardcopy

This report presents in four chapters a model for the scalability analysis of the Data Server subsystem of the Earth Observing System Data and Information System (EOSDIS) Core System (ECS). The model analyzes if the planned architecture of the Data Server will support an increase in the workload with the possible upgrade and/or addition of processors, storage subsystems, and networks. The approaches in the report include a summary of the architecture of ECS's Data server as well as a high level description of the Ingest and Retrieval operations as they relate to ECS's Data Server. This description forms the basis for the development of the scalability model of the data server and the methodology used to solve it.

Author

Workloads (Psychophysiology); Models; Information Systems; Data Systems

20040008640 George Mason Univ., Fairfax, VA, USA

Scalability Analysis and Use of Compression at the Goddard DAAC and End-to-End MODIS Transfers

Menasce, Daniel A.; [1998]; 7 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-555-72-55; No Copyright; Avail: CASI; [A02](#), Hardcopy

The goal of this task is to analyze the performance of single and multiple FTP transfer between SCF's and the Goddard DAAC. We developed an analytic model to compute the performance of FTP sessions as a function of various key parameters, implemented the model as a program called FTP Analyzer, and carried out validations with real data obtained by running single and multiple FTP transfer between GSFC and the Miami SCF. The input parameters to the model include the mix to FTP sessions (scenario), and for each FTP session, the file size. The network parameters include the round trip time, packet loss rate, the limiting bandwidth of the network connecting the SCF to a DAAC, TCP's basic timeout, TCP's Maximum Segment Size, and TCP's Maximum Receiver's Window Size. The modeling approach used consisted of modeling TCP's overall throughput, computing TCP's delay per FTP transfer, and then solving a queuing network model that includes the FTP clients and servers.

Author

Mathematical Models; Imaging Spectrometers; Performance Prediction

20040008641 Rutgers Univ., Newark, NJ, USA

Geodata Modeling and Query in Geographic Information Systems

Adam, Nabil; October 1996; 74 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-555-46/NASA; No Copyright; Avail: CASI; [A04](#), Hardcopy

Geographic information systems (GIS) deal with collecting, modeling, managing, analyzing, and integrating spatial (locational) and non-spatial (attribute) data required for geographic applications. Examples of spatial data are digital maps, administrative boundaries, road networks, and those of non-spatial data are census counts, land elevations and soil characteristics. GIS shares common areas with a number of other disciplines such as computer- aided design, computer cartography, database management, and remote sensing. None of these disciplines however, can by themselves fully meet the requirements of a GIS application. Examples of such requirements include: the ability to use locational data to produce high quality plots, perform complex operations such as network analysis, enable spatial searching and overlay operations, support spatial analysis and modeling, and provide data management functions such as efficient storage, retrieval, and modification of large datasets; independence, integrity, and security of data; and concurrent access to multiple users. It is on the data management issues that we devote our discussions in this monograph. Traditionally, database management technology have been developed for business applications. Such applications require, among other things, capturing the data requirements of high-level business functions and developing machine- level implementations; supporting multiple views of data and yet

providing integration that would minimize redundancy and maintain data integrity and security; providing a high-level language for data definition and manipulation; allowing concurrent access to multiple users; and processing user transactions in an efficient manner. The demands on database management systems have been for speed, reliability, efficiency, cost effectiveness, and user-friendliness. Significant progress have been made in all of these areas over the last two decades to the point that many generalized database platforms are now available for developing data intensive applications that run in real-time. While continuous improvement is still being made at a very fast-paced and competitive rate, new application areas such as computer aided design, image processing, VLSI design, and GIS have been identified by many as the next generation of database applications. These new application areas pose serious challenges to the currently available database technology. At the core of these challenges is the nature of data that is manipulated. In traditional database applications, the database objects do not have any spatial dimension, and as such, can be thought of as point data in a multi-dimensional space. For example, each instance of an entity EMPLOYEE will have a unique value corresponding to every attribute such as employee id, employee name, employee address and so on. Thus, every Employee instance can be thought of as a point in a multi-dimensional space where each dimension is represented by an attribute. Furthermore, all operations on such data are one-dimensional. Thus, users may retrieve all entities satisfying one or more constraints. Examples of such constraints include employees with addresses in a certain area code, or salaries within a certain range. Even though constraints can be specified on multiple attributes (dimensions), the search for such data is essentially orthogonal across these dimensions.

Derived from text

Data Management; Data Base Management Systems; Geographic Information Systems; Real Time Operation; Computer Aided Mapping; Computer Information Security

20040008642 George Washington Univ., Washington, DC, USA

Understanding and Improving High-Performance I/O Subsystems

El-Ghazawi, Tarek A.; Frieder, Gideon; Clark, A. James; [1996]; 54 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-18; No Copyright; Avail: CASI; [A04](#), Hardcopy

This research program has been conducted in the framework of the NASA Earth and Space Science (ESS) evaluations led by Dr. Thomas Sterling. In addition to the many important research findings for NASA and the prestigious publications, the program has helped orienting the doctoral research program of two students towards parallel input/output in high-performance computing. Further, the experimental results in the case of the MasPar were very useful and helpful to MasPar with which the P.I. has had many interactions with the technical management. The contributions of this program are drawn from three experimental studies conducted on different high-performance computing testbeds/platforms, and therefore presented in 3 different segments as follows: 1. Evaluating the parallel input/output subsystem of a NASA high-performance computing testbeds, namely the MasPar MP- 1 and MP-2; 2. Characterizing the physical input/output request patterns for NASA ESS applications, which used the Beowulf platform; and 3. Dynamic scheduling techniques for hiding I/O latency in parallel applications such as sparse matrix computations. This study also has been conducted on the Intel Paragon and has also provided an experimental evaluation for the Parallel File System (PFS) and parallel input/output on the Paragon. This report is organized as follows. The summary of findings discusses the results of each of the aforementioned 3 studies. Three appendices, each containing a key scholarly research paper that details the work in one of the studies are included.

Derived from text

Input/Output Routines; Parallel Processing (Computers); Massively Parallel Processors

20040008656 Maryland Univ. Baltimore County, Catonsville, MD, USA

Performance Modeling of Network-Attached Storage Device Based Hierarchical Mass Storage Systems

Menasce, Daniel A.; Pentakalos, Odysseas I.; October 13, 1995; 17 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-40; No Copyright; Avail: CASI; [A03](#), Hardcopy

Network attached storage devices improve I/O performance by separating control and data paths and eliminating host intervention during the data transfer phase. Devices are attached to both a high speed network for data transfer and to a slower network for control messages. Hierarchical mass storage systems use disks to cache the most recently used files and a combination of robotic and manually mounted tapes to store the bulk of the files in the file system. This paper shows how queuing network models can be used to assess the performance of hierarchical mass storage systems that use network attached storage devices as opposed to host attached storage devices. Simulation was used to validate the model. The analytic model presented here can be used, among other things, to evaluate the protocols involved in I/O over network attached devices.

Author

Storage; Network Control; Mathematical Models; Performance Prediction

20040008657 Maryland Univ. Baltimore County, Catonsville, MD, USA

Performance Analysis of the Unitree Central File

Pentakalos, Odysseas I.; Flater, David; April 22, 1994; 86 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA/5555-24/NASA; No Copyright; Avail: CASI; [A05](#), Hardcopy

This report consists of two parts. The first part briefly comments on the documentation status of two major systems at NASA's Center for Computational Sciences, specifically the Cray C98 and the Convex C3830. The second part describes the work done on improving the performance of file transfers between the Unitree Mass Storage System running on the Convex file server and the users workstations distributed over a large geographic area.

Author

Reliability Analysis; Cray Computers

20040008663 Duke Univ., Durham, NC, USA

Image Compression: Algorithms and Architectures

Reif, John; Tate, Steve; Markas, Tassos; [1993]; 14 pp.; In English

Contract(s)/Grant(s): NAS5-30428; NAS5-32337; USRA-5555-33; No Copyright; Avail: CASI; [A03](#), Hardcopy

This project is concerned with research efforts in the development of data compression algorithms and architectures. The goal was to provide NASA with some innovative solutions for handling large volumes of information in terms of software programs that can be executed within reasonable amount of time given today's technology, and hardware devices that can perform real-time data compression. During this research effort we devised several novel and improved data compression algorithms and investigated their theoretical aspects as well as evaluated their performance against existing methods, designed parallel architectures for lossy and lossless compression, and developed software programs to implement several of the new algorithms and to simulate various hardware architectures (in addition to software for basic existing compression methods and basic image processing functions that were necessary for our study).

Author

Data Compression; Algorithms; Architecture (Computers)

20040008665 Maryland Univ., College Park, MD, USA

EOSDIS Project on High-Performance I/O Techniques

Saltz, Joel; Acharya, Anurag; Sussman, Alan; [1995]; 5 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-41; No Copyright; Avail: CASI; [A01](#), Hardcopy

The goals of this project were two-fold: to understand the I/O requirements of algorithms for data product generation and to develop techniques that help meet these requirements on suitably configured machines. Towards the first goal, we have analyzed a variety of existing data product generation programs and have successfully parallelized two of them, pathfinder and climate which generate the Level 2 and Level 3 data products for the AVHRR land Pathfinder effort. We have also developed a parallel I/O library suitable for parallel data generation programs. We will describe our experiences in Section 2. We will also present our suggestions regarding the structure of EOSDIS data product generation programs, the organization of the used to store the data products and the runtime support needed for effective parallelization of data product generation applications.

Author

Input/Output Routines; Algorithms; Climate; Data Processing

20040008670 Deputy Under Secretary of the Army, Washington, DC, USA

Army Model and Simulation Master Plan

May 1994; 53 pp.; In English

Report No.(s): AD-A418733; No Copyright; Avail: CASI; [A04](#), Hardcopy

The purpose of this document is to promote the adoption of standards, and common tools and processes in building and populating models and simulations (M&S) for use in all applications throughout the Army. The benefits of such investment are greater efficiency, increased interoperability, improved portability, expansibility, extensibility and enhanced credibility for all Army M&S, both those incorporated into the distributed simulation environment and those which remain in stand-alone mode. An ancillary purpose of this Master Plan is to provide ready reference to the multiple players in the Army M&S community. This capability is captured at Appendix C.

DTIC

Interoperability; Military Technology

20040008831 NASA Glenn Research Center, Cleveland, OH, USA

Modified Involute Helical Gears: Computerized Design, Simulation of Meshing and Stress Analysis

Jun. 2003; 66 pp.; In English

Contract(s)/Grant(s): NAG3-2450

Report No.(s): AD-A417105; NASA/CR-2003-212229; ARL-CR-514; No Copyright; Avail: CASI; [A04](#), Hardcopy

The computerized design, methods for generation, simulation of meshing, and enhanced stress analysis of modified involute helical gears is presented. The approaches proposed for modification of conventional involute helical gears are based on conjugation of double-crowned pinion with a conventional helical involute gear. Double-crowning of the pinion means deviation of cross-profile from an involute one and deviation in longitudinal direction from a helicoid surface. Using the method developed, the pinion-gear tooth surfaces are in point-contact, the bearing contact is localized and oriented longitudinally, and edge contact is avoided. Also, the influence of errors of alignment on the shift of bearing contact, vibration, and noise are reduced substantially. The theory developed is illustrated with numerical examples that confirm the advantages of the gear drives of the modified geometry in comparison with conventional helical involute gears.

DTIC

Computer Aided Design; Gears; Stress Analysis; Computerized Simulation

20040008926 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Most Advanced Wireless Technology in Scotland Launched at EICC

NTT Technical Review, Volume 1, No. 7; October 2003, pp. 95-96; In English; See also 20040008922; Copyright; Avail: Other Sources

In this joint R&D, Hitachi provided secure implementation technology for elliptic curve operations, Mitsubishi Electric provided efficient implementation technology for elliptic curve operations, and NTT provided efficient and secure implementation technology for the basic arithmetic.

Derived from text

Cryptography; Algorithms

20040008936 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Three Leading Japanese Firms Jointly Develop a New Encryption Technology: Elliptic Curve Cryptosystem (ECDSA Signature)

NTT Technical Review, Volume 1, No. 7; October 2003, pp. 94-95; In English; See also 20040008922; Copyright; Avail: Other Sources

Hitachi, Ltd., Mitsubishi Electric Corporation, and NTT announced on July 28, 2003 their success in jointly researching and developing a secure and efficient implementation for an elliptic curve cryptosystem (ECDSA signature)*1, which they have called CRESERC. This is the world's first case of well-established leaders in the field of cryptography collaborating in the development of implementation technology by integrating their advanced skills and technologies.

Author

Cryptography; Algorithms

20040010327 NASA Ames Research Center, Moffett Field, CA, USA

Experimental Evaluation of Verification and Validation Tools on Martian Rover Software

Brat, Guillaume; Giannakopoulou, Dimitra; Goldberg, Allen; Havelund, Klaus; Lowry, Mike; Pasareani, Corina; Venet, Arnaud; Visser, Willem; Washington, Rich; [2003]; 33 pp.; In English; No Copyright; Avail: CASI; [A03](#), Hardcopy

We report on a study to determine the maturity of different verification and validation technologies (V&V) on a representative example of NASA flight software. The study consisted of a controlled experiment where three technologies (static analysis, runtime analysis and model checking) were compared to traditional testing with respect to their ability to find seeded errors in a prototype Mars Rover. What makes this study unique is that it is the first (to the best of our knowledge) to do a controlled experiment to compare formal methods based tools to testing on a realistic industrial-size example where the emphasis was on collecting as much data on the performance of the tools and the participants as possible. The paper includes a description of the Rover code that was analyzed, the tools used as well as a detailed description of the experimental setup and the results. Due to the complexity of setting up the experiment, our results can not be generalized, but we believe it can still serve as a valuable point of reference for future studies of this kind. It did confirm the belief we had that advanced

tools can outperform testing when trying to locate concurrency errors. Furthermore the results of the experiment inspired a novel framework for testing the next generation of the Rover.

Author

Mars Roving Vehicles; Computer Programs; Program Verification (Computers); NASA Space Programs; Software Development Tools

20040010332 NASA Ames Research Center, Moffett Field, CA, USA

Experimental Evaluation of Verification and Validation Tools on Martian Rover Software

Brat, Guillaume; Giannakopoulou, Dimitra; Goldberg, Allen; Havelund, Klaus; Lowry, Mike; Pasareanu, Corina; Venet, Arnaud; Visser, Willem; [2003]; 13 pp.; In English; CMU Workshop on Model Checking, Pittsburgh, PA, USA; No Copyright; Avail: CASI; [A03](#), Hardcopy

To achieve its science objectives in deep space exploration, NASA has a need for science platform vehicles to autonomously make control decisions in a time frame that excludes intervention from Earth-based controllers. Round-trip light-time is one significant factor motivating autonomy capability, another factor is the need to reduce ground support operations cost. An unsolved problem potentially impeding the adoption of autonomy capability is the verification and validation of such software systems, which exhibit far more behaviors (and hence distinct execution paths in the software) than is typical in current deepspace platforms. Hence the need for a study to benchmark advanced Verification and Validation (V&V) tools on representative autonomy software. The objective of the study was to assess the maturity of different technologies, to provide data indicative of potential synergies between them, and to identify gaps in the technologies with respect to the challenge of autonomy V&V. The study consisted of two parts: first, a set of relatively independent case studies of different tools on the same autonomy code, second a carefully controlled experiment with human participants on a subset of these technologies. This paper describes the second part of the study. Overall, nearly four hundred hours of data on human use of three different advanced V&V tools were accumulated, with a control group that used conventional testing methods. The experiment simulated four independent V&V teams debugging three successive versions of an executive controller for a Martian Rover. Defects were carefully seeded into the three versions based on a profile of defects from CVS logs that occurred in the actual development of the executive controller. The rest of the document is structured as follows. In section 2 and 3, we respectively describe the tools used in the study and the rover software that was analyzed. In section 4 the methodology for the experiment is described; this includes the code preparation, seeding of defects, participant training and experimental setup. Next we give a qualitative overview of how the experiment went from the point of view of each technology; model checking (section 5), static analysis (section 6), runtime analysis (section 7) and testing (section 8). The final section gives some preliminary quantitative results on how the tools compared.

Derived from text

Mars (Planet); Program Verification (Computers); Mars Roving Vehicles; Computer Programs; Software Development Tools

20040010355 NASA Ames Research Center, Moffett Field, CA, USA

EAGLE Monitors by Collecting Facts and Generating Obligations

Barringer, Howard; Goldberg, Allen; Havelund, Klaus; Sen, Koushik; [2003]; 16 pp.; In English; TACAS '04, Apr. 2004, Barcelona, Spain

Contract(s)/Grant(s): EPSRC-GR/S40435/01; Copyright; Avail: CASI; [A03](#), Hardcopy

We present a rule-based framework, called EAGLE, that has been shown to be capable of defining and implementing a range of finite trace monitoring logics, including future and past time temporal logic, extended regular expressions, real-time and metric temporal logics, interval logics, forms of quantified temporal logics, and so on. A monitor for an EAGLE formula checks if a finite trace of states satisfies the given formula. We present, in details, an algorithm for the synthesis of monitors for EAGLE. The algorithm is implemented as a Java application and involves novel techniques for rule definition, manipulation and execution. Monitoring is achieved on a state-by-state basis avoiding any need to store the input trace of states. Our initial experiments have been successful as EAGLE detected a previously unknown bug while testing a planetary rover controller.

Author

Temporal Logic; Computer Systems Programs; Algorithms; Monitors

20040010497 Object Services and Consulting, Inc., Baltimore, MD, USA

Software Surveyor

Wells, Davide; Pazandak, Paul; Oct. 2003; 106 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-00-C-0206; Proj-DASA

Report No.(s): AD-A419185; AFRL-IF-RS-TR-2003-239; No Copyright; Avail: CASI; [A06](#), Hardcopy

This contractual effort researched and developed technology that enables systems to meet high assurance, high dependability, and high adaptability requirements. Object Services built gauges to collect, analyze and present information about how deployed instances of distributed software actually interact. The non-intrusive gauges illustrate the interaction patterns, how far the effects of changes can propagate and whether an anticipated action is likely to be safe and identify subtle differences between environments that might be the source of puzzling misbehavior. The software gauges are suitable for use in profiling software applications constructed using JAVA.

DTIC

Computer Programs; Software Development Tools; Technology Utilization

20040010534 Naval Postgraduate School, Monterey, CA

Ship Shock Trial Modeling and Simulation of USS WINSTON S. CHURCHILL (DDG 81)

Schneider, Nathan A.; Shin, Young S.; Sep. 2003; 187 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419366; NPS-ME-03-004; No Copyright; Avail: CASI; [A09](#), Hardcopy

During World War II many surface combatants were damaged or severely crippled by close-proximity underwater explosions from ordnance that had actually missed their target. Since this time all new classes of combatants have been required to conduct shock trial tests on the lead ship of the class in order to test the survivability of mission essential equipment in a severe shock environment. While these tests are extremely important in determining the vulnerabilities of a surface ship they require an extensive amount of preparation manhours, and money. Furthermore, these tests present an obvious danger to the crew on board, the ship itself, and any marine life in the vicinity. Creating a virtual shock environment by use of a computer to model the ship structure and the surrounding fluid presents a valuable design tool and an attractive alternative to these tests. The research summarized in this report investigated the accuracy of shock simulation using the shock trials conducted on USS WINSTON S. CHURCHILL (DDG 81) in 2001. All three explosions DDG 81 was subjected to are simulated and the resulting predictions compared with actual shock trial data. The effects of fluid volume size, mesh density, mesh quality, and shot location are investigated.

DTIC

Computerized Simulation; Shock Tests; Marine Biology; Ships; Mathematical Models

20040010642 California Univ., Irvine, CA

COPPER: Compiler-Controlled On-Demand Approach to Power-Efficient Computing

Dutt, Nikil; Gupta, Rajesh; Nicolau, Alex; Veidenbaum, Alex; Sep. 2003; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-00-C-1632; Proj-ARPI

Report No.(s): AD-A418787; AFRL-IF-WP-TM-2003-1548; No Copyright; Avail: CASI; [A03](#), Hardcopy

The goal of this research was to build and demonstrate a capability in hardware (processors-memory) and software for management of power resources, and explore its trade-off against speed, accuracy and throughput requirements. The emphasis of this project was as much on utilization of the most power efficient architectural and software techniques as on their coordinated management across hardware and software levels. Through a coordinated management of power-control knobs from compiler to architectural and micro-architectural strategies we were able to achieve a range of power adaptation versus performance needs. However, instead of only leveraging on low power design approaches used in the embedded world and building on our own previous research on adaptive system software, we were also able to investigate power adaptation at the hardware and software levels. Our techniques collectively achieved a factor of 2-4x power/energy reduction.

DTIC

Data Processing; Optimization

20040010652 Naval Postgraduate School, Monterey, CA

System Evaluation of Hardware and Software for a Streaming Multimedia Server Using the Multicasting Protocol

Carls, John; Sep. 2003; 79 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418535; No Copyright; Avail: CASI; [A05](#), Hardcopy

The next step in the evolution of services provided on an intranet or the internet will be distributed or distance learning with collaboration among peers. Currently, this is done on a one-to-one basis. To expand to a one-to-many collaboration environment, there needs to be a server distributing the multimedia content without creating additional network traffic even though many users are accessing or viewing the multimedia content. Multicasting allows many users to view multimedia content without creating additional network traffic. There is a server providing multimedia content to a multicast address so

users may access it. This thesis defines metrics and conducts a comparison of different servers capable of distributing multimedia content using the multicasting protocol.

DTIC

Protocol (Computers); Virtual Reality

20040010700 Rutherford Appleton Lab., Oxford, UK

TOSCA User-Guide

Parker, S. F.; Tomkinson, J.; Ramirez-Cuesta, A. J.; Colognesi, D.; May 2003; 78 pp.

Report No.(s): PB2004-102122; RAL-TR-2003-015; Copyright; Avail: National Technical Information Service (NTIS)

This document is designed as an aide-memoire to help you run your experiment and analyze your data. It is not intended as a substitute for training. For new users and those who are not regular users, it is essential that you are properly trained in the use of the instrument by your local contact or the instrument scientist. This manual is specific for the latest version of TOSCA.

NTIS

Neutron Scattering; Neutron Spectrometers; User Manuals (Computer Programs)

20040010731 Research and Technology Organization, Cedex, France

A New Vortex Flow Experiment for Computer Code Validation

Hummel, D.; Redeker, G.; Mar. 2003; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418791; No Copyright; Avail: CASI; [A03](#), Hardcopy

In this paper the present knowledge on the vortex formation on slender delta wings is summarized. The interference mechanisms between primary and secondary vortices as well as the vortex breakdown phenomenon are especially emphasized. The effects of Mach number and Reynolds number are treated separately and the differences in the flow around wings with sharp and rounded leading edges are discussed. The experimental details necessary for the validation of numerical methods are derived and a brief review of relevant modern experimental techniques is given. Finally a configuration suited for a new International Vortex Flow Experiment (VFE-2) as well as a corresponding test program are presented.

DTIC

Computer Programs; Program Verification (Computers); Vortices

20040010737 Arcon Corp., Waltham, MA

Application of Radiative Transfer Techniques to Background Clutter Mitigation

Wintersteiner, Peter P.; Oct. 22, 2002; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F19628-00-C-0072; Proj-2305

Report No.(s): AD-A418813; AFRL-VS-TR-2002-1666; No Copyright; Avail: CASI; [A03](#), Hardcopy

Radiative-transfer techniques have been applied to several problems of interest to the defense and remote-sensing communities. We looked at MWIR radiance in the presence of gravity waves. We simulated radiance structures that had been seen by the MSX satellite, and estimated the expected non-LTE contribution. We also report on our first look at some of the SABER data from the TIMED satellite.

DTIC

Radiative Transfer; Infrared Detectors

20040010739 Single Integrated Air Picture System Engineering Task Force, Arlington, VA, USA

Single Integrated Air Picture (SIAP) Attributes

Karoly, S. J.; Dutchyshyn, H.; Wilson, J. W.; Maluda, J. W.; Aug. 2003; 52 pp.; In English

Report No.(s): AD-A418818; SIAP SE TF-TR-2001-001; No Copyright; Avail: CASI; [A04](#), Hardcopy

The SIAP Implementation Plan states that the overarching objective of the SIAP SE TF is 'to identify incremental improvements in the ... SIAP capability that will provide commensurate incremental improvements in warfighter capabilities' (SIAP Implementation Plan, 2001). Quantification of the SIAP capability in evaluative, predictive, and prescriptive terms is a necessary step towards assessment of such improvements. Multiple measures currently exist to evaluate the SIAP, but there is much overlap and some potential for conflict and confusion between similar measures. Furthermore, many of these existing measures have not been precisely quantified, or have been quantified with no apparent predictive or prescriptive goals in mind. Therefore, there is a clear need to consolidate and more rigorously define a core set of attributes, which provide the joint community with a common point of departure for quantifying and assessing a SIAP. These attributes must be traceable to

Theater Air and Missile Defense (TAMD) and Combat Identification (OID) Capstone Requirements Document (CRD) Key Performance Parameters (KPPs), augmenting the latter where either quantitative precision or a sharper focus on warfighting benefit is necessary. The SIAP SE TF Technical Reports 2001-001, 2001-002, 2001-003, and 2002- 007 were developed by the SIAP SE TF to correct for the deficiencies cited above by providing a standard set of definitions and algorithms for quantitative evaluation of air picture quality within the TAMD community. The measures apply to models, simulations, hardware and software in the loop experiments, operator in the loop exercises, and field exercises and evaluations. This revision is based on experience gained within the community from application of those technical reports across the spectrum of those venues.

DTIC

Combat; Computer Programs; Missile Defense

20040010754 New York Univ., New York, NY

ASC3: Algorithmic Strategies for Compiler Controlled Caches

Goldberg, Benjamin; Palem, Krishna V.; Rabin, Michael O.; Oct. 2003; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-99-1-1499; Proj-ARPI

Report No.(s): AD-A418767; AFRL-IF-WP-TR-2003-1546; No Copyright; Avail: CASI; [A03](#), Hardcopy

The ASC3 effort was a collaboration among research groups. The effort focused on strategies for improving the performance of data-intensive and memory-bound programs through the innovation of algorithmic approaches in the following areas: 1) The management of programmable memory hierarchies, 2) Data remapping and speculative execution for improved cache performance, and 3) Compiler optimizations that are tolerant to memory aliasing. The techniques developed by the ASC3 effort were applied to a number of data-intensive applications, including automatic target recognition, database management, image matching, neural network simulation and scientific computation. The strategies were validated using industry-strength simulation and emulation tools, based on the Trimaran EPIC Research Infrastructure. The optimizations developed in the program exploited trends in microprocessor design and are applicable to current platforms, emerging EPIC architectures, and future generations of COTS software. The ASC3 effort also extended the functionality of the Trimaran Compiler EPIC infrastructure.

DTIC

Information Retrieval; Compilers; Data Base Management Systems; Microprocessors

20040010806 California Univ., Los Angeles, CA

PACT: Power Aware Compilation and Architectural Techniques

Sarrafzadeh, Majid; Banerjee, Prithviraj; Choudhary, Alok; Moshovos, Andreas; Aug. 2003; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-00-C-1631; Proj-ARPI

Report No.(s): AD-A418780; 0650-350-D401; AFRL-IF-WP-TM-2003-1547; No Copyright; Avail: CASI; [A03](#), Hardcopy

The goal of this project was to take DoD applications written in C and generate power and performance efficient code for systems utilizing the architectural power- aware techniques developed. The PACT project consisted of 3 research tasks: 1) Power-aware architectural approaches, 2) Power-aware compilation strategies, and 3) Power-aware CAD tools for power estimation and synthesis. As part of the power aware architecture research, we developed power aware techniques for on-chip buses, power aware memory hierarchies, and a framework to evaluate heterogeneous embedded systems for performance and energy consumption. As part of the power aware compiler research, we have developed a compiler that takes general C programs and generates power aware codes for three targets: 1) General purpose embedded processor such as the StrongARM, 2) General purpose field-programmable gate arrays (FPGAs), and 3) General purpose application specific integrated circuits (ASICs). We have developed improved strategies for power optimization and management, and improved design methodologies and design philosophies for better estimation and optimization.

DTIC

Computer Programs; Compilers

20040010828 Northwestern Univ., Evanston, IL, USA

Shared Semantic Representations for Coordinating Distributed Robot Teams

Horswill, Ian; Dec. 2003; 41 pp.; In English

Contract(s)/Grant(s): DAAN02-98-C-4023

Report No.(s): AD-A418915; NATICK-TR-04/003; No Copyright; Avail: CASI; [A03](#), Hardcopy

Most physically implemented multi-robot controllers are based on extensions of behavior-based systems. While efficient, such techniques suffer from a paucity of representational power. Symbolic systems, on the other hand, have more sophisticated representations but are computationally complex and have model coherency issues. In this report, the authors describe HIVEMind (Highly Interconnected Verbose Mind), a tagged behavior-based architecture for small teams of cooperative robots. In HIVEMind, robots share inferences and sensory data by treating other team members as virtual sensors connected by wireless links. A novel representation based on bit-vectors allows team members to share intentional, attentional, and sensory information using relatively low-bandwidth connections. The authors describe an application of the architecture to the problem of systematic spatial search. (5 tables, 11 figures, 25 refs.)

DTIC

Computer Programs; Robots

20040010835 NASA Ames Research Center, Moffett Field, CA, USA

Performance Characteristics of the Multi-Zone NAS Parallel Benchmarks

Jin, Haoqiang; VanderWijngaart, Rob F.; [2003]; 15 pp.; In English; International Parallel and Distributed Processing Symposium, Apr. 2004, Santa Fe, NM, USA

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; RTOP 704-42-42; Copyright; Avail: CASI; [A03](#), Hardcopy

We describe a new suite of computational benchmarks that models applications featuring multiple levels of parallelism. Such parallelism is often available in realistic flow computations on systems of grids, but had not previously been captured in bench-marks. The new suite, named NPB Multi-Zone, is extended from the NAS Parallel Benchmarks suite, and involves solving the application benchmarks LU, BT and SP on collections of loosely coupled discretization meshes. The solutions on the meshes are updated independently, but after each time step they exchange boundary value information. This strategy provides relatively easily exploitable coarse-grain parallelism between meshes. Three reference implementations are available: one serial, one hybrid using the Message Passing Interface (MPI) and OpenMP, and another hybrid using a shared memory multi-level programming model (SMP+OpenMP). We examine the effectiveness of hybrid parallelization paradigms in these implementations on three different parallel computers. We also use an empirical formula to investigate the performance characteristics of the multi-zone benchmarks.

Author

Parallel Programming; Performance Tests; Supercomputers; Applications Programs (Computers); Mathematical Models

20040012651 SRS Technologies, Huntsville, AL, USA

Integrated Optical Design Analysis (IODA): New Test Data and Modeling Features

Moore, Jim; Troy, Ed; Patrick, Brian; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

A general overview of the capabilities of the IODA ('Integrated Optical Design Analysis') exchange of data and modeling results between thermal, structures, optical design, and testing engineering disciplines. This presentation focuses on new features added to the software that allow measured test data to be imported into the IODA environment for post processing or comparisons with pretest model predictions. software is presented. IODA promotes efficient

Author

Optical Equipment; Computer Programs

20040012706 Computer Sciences Corp., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA

An Expert System for the Development of Efficient Parallel Code

Jost, Gabriele; Chun, Robert; Jin, Hao-Qiang; Labarta, Jesus; Gimenez, Judit; April 26, 2004; 16 pp.; In English; International Parallel and Distributed Processing Symposium, April 2004, Santa Fe, NM, USA

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; TIC2001-0995-C02-01; Copyright; Avail: CASI; [A03](#), Hardcopy

We have built the prototype of an expert system to assist the user in the development of efficient parallel code. The system was integrated into the parallel programming environment that is currently being developed at NASA Ames. The expert system interfaces to tools for automatic parallelization and performance analysis. It uses static program structure information and performance data in order to automatically determine causes of poor performance and to make suggestions for improvements. In this paper we give an overview of our programming environment, describe the prototype implementation of our expert system, and demonstrate its usefulness with several case studies.

Author

Expert Systems; Parallel Programming; Prototypes; Architecture (Computers); Computer Systems Programs

20040012728 Eidgenoessische Technische Hochschule, Zurich, Switzerland, QSS Group, Inc., Moffett Field, CA, USA

Applying Jlint to Space Exploration Software

Artho, Cyrille; Havelund, Klaus; [2004]; 12 pp.; In English; Fifth International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI 2004), 11-13 Jan. 2004, Venice, Italy; Copyright; Avail: CASI; [A03](#), Hardcopy

Java is a very successful programming language which is also becoming widespread in embedded systems, where software correctness is critical. Jlint is a simple but highly efficient static analyzer that checks a Java program for several common errors, such as null pointer exceptions, and overflow errors. It also includes checks for multi-threading problems, such as deadlocks and data races. The case study described here shows the effectiveness of Jlint in find-false positives in the multi-threading warnings gives an insight into design patterns commonly used in multi-threaded code. The results show that a few analysis techniques are sufficient to avoid almost all false positives. These techniques include investigating all possible callers and a few code idioms. Verifying the correct application of these patterns is still crucial, because their correct usage is not trivial.

Author

Java (Programming Language); Space Exploration; Computer Programs; Software Engineering

20040012815 ProLogic, Inc., USA

Optimizing IV and V for Mature Organizations

Fuhman, Christopher; [2003]; 1 pp.; In English

Contract(s)/Grant(s): FL-2003-04; No Copyright; Avail: Other Sources; Abstract Only

NASA is intending for its future software development agencies to have at least a Level 3 rating in the Carnegie Mellon University Capability Maturity Model (CMM). The CMM has built-in Verification and Validation (V&V) processes that support higher software quality. Independent Verification and Validation (IV&V) of software developed by mature agencies can be therefore more effective than for software developed by less mature organizations. How is Independent V&V different with respect to the maturity of an organization? Knowing a priori the maturity of an organization's processes, how can IV&V planners better identify areas of need choose IV&V activities, etc? The objective of this research is to provide a complementary set of guidelines and criteria to assist the planning of IV&V activities on a project using a priori knowledge of the measurable levels of maturity of the organization developing the software.

Author

Program Verification (Computers); Optimization; Software Engineering; Organizations

20040012886 Georgia Tech Research Inst., Atlanta, GA, USA

Compiler Optimizations for Power-Aware Computing. Volume 1 of 2

Mooney, Vincent J., III; Sep. 2003; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-00-2-0564; DARPA ORDER-J870; Proj-HPSW

Report No.(s): AD-A418765; AFRL-IF-RS-TR-2003-220-VOL-1; No Copyright; Avail: CASI; [A03](#), Hardcopy

This final report summarizes work done on the DARPA funded project 'Compiler Optimizations for Power Aware Computing.' Volume I addresses methodologies invented that can be categorized as software based approaches, hardware based approaches and combined software/hardware based approaches. One of the software based approaches, data remapping, showed a 3.1X energy*delay reduction on a realistic example. One of the hardware based approaches, frequency/voltage scaling of second- level memory, showed a 1.3X energy*delay reduction on a realistic example. A combination of data remapping and frequency/ voltage scaling of second level memory showed a 2. 6X reduction in energy*delay but also showed the lowest power (energy/time) of any of the approaches considered. Volume II addresses realization of the world's first Wearable Motherboard or an intelligent garment for the 21st Century. The motherboard provides an extremely versatile framework for the incorporation of sensing, monitoring, and information processing devices.

DTIC

Compilers; Computer Programs; Optimization

20040012927 BAE Systems, UK

Vortex Effects in the Dynamics of Underwater Weapons

Lyes, P. A.; Steer, A. P.; Mar. 2003; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419104; No Copyright; Avail: CASI; [A03](#), Hardcopy

As the control and mobility of submarines are improved to meet the challenges of the 21st-century security environment, so the capabilities of underwater weapons must keep pace with these developments. An underwater weapon is typically

propelled by a pump-jet, controlled by an arrangement of movable lifting surfaces, and stabilized by fixed fins. The propulsor, fins, and control surfaces are situated close together at the tail, and close to the axis of the weapon due to the requirements for weapons to be launched through tubes. The control and propulsion components form a closely coupled hydrodynamic system in which the rate of fluid flow through the propulsor strongly affects both the propulsion and the control characteristics of the weapon. Vortices are generated by the cylindrical body and fins of the weapon during maneuvers. These are intimately linked with the rest of the flow field generated by the vehicle. This study seeks to assess the degree to which the maneuvering forces experienced by the vehicle are affected by the vortices, and how these are modified by the effect of the propulsor and control systems. A detailed model of the propulsor has been developed using stage interfaces to construct a fluid dynamic model of the duct, working rotor, and stator, with resolved flows around the blades. This is a significant improvement over models that used a momentum source for the effect of the rotor and stator, but did not include the blade flows. This study shows that the CFD method can predict propulsion characteristics. The modeling of the complete, three- dimensional vehicle with working propulsor, at angles of yaw, enables the matching of CFD models for the vehicle and propulsor, the computation of forces at yaw angles, and validation of the vehicle flow through comparison with measured data. (10 figures, 3 refs.)

DTIC

Computerized Simulation; Torpedoes; Vortices; Computational Fluid Dynamics; Hydrodynamics; Flow Distribution

20040013009 Communications Research Lab., Tokyo, Japan

Space Weather Research with Computer Simulations

Shimazu, Hironori; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 155-161; In English; See also 20040012998; Copyright; Avail: Other Sources

Computer simulations in space weather researches are reviewed. We introduce two different points of view and methods of the computer simulation, which are characteristic of the space weather simulations: One is the view from global macro-structure and the other is the one from fundamental micro-structure.

Author

Computerized Simulation; Space Weather

20040013016 Massachusetts Inst. of Tech., Lexington, MA

LLAMA (Lincoln Laboratory Advanced MARTHA Applications) Software Manual

White, D. W.; Dec. 2003; 107 pp.; In English

Contract(s)/Grant(s): F19628-00-C-0002

Report No.(s): AD-A418941; TR-1088; ESC-TR-2003-056; No Copyright; Avail: CASI; [A06](#), Hardcopy

For the past 25 years or more, a number of staff members at MIT Lincoln Laboratory have made extensive use of the APL computer language to solve a variety of problems, primarily in the area of radio frequency and microwave circuit design. This was aided and inspired by the availability of the MARTHA software package, which is a collection of APL-based circuit analysis functions developed by Professor Paul Penfield Jr. at MIT. The Lincoln Laboratory Advanced MARTHA Applications (or LLAMA for short) is a set of 15 workspaces (a collection of APL functions) developed primarily in conjunction with MARTHA. Many of the workspaces are an extension of MARTHA, and allow the use of a new circuit elements or new types of analysis. A number of workspaces are devoted to filter synthesis, using both lumped elements and coupled microstrip transmission lines. Other workspaces are aimed toward RF system design, including mixer-spur and dynamic-range analysis. This manual is intended to provide more formal documentation for this resource than has previously been available. It is hoped that it will allow new users to quickly make use of all that APL and MARTHA have to offer, as well as providing a concise, well-indexed reference for the more experienced user.

DTIC

Computer Programs; Microwave Equipment; Network Analysis

62

COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20040008879 Manchester Univ., UK, Birmingham Univ., UK, Rutherford Appleton Lab., Chilton, UK

BaBar Web Job Submission with Globus Authentication and AFS Access

Barlow, R. J.; Forti, A.; McNab, A.; Salih, S.; Smith, D.; Jun. 2003; In English

Report No.(s): DE2003-813353; SLAC-PUB-9983; No Copyright; Avail: National Technical Information Service (NTIS)

We present two versions of a grid job submission system produced for the BaBar experiment. Both use globus job submission to process data spread across various sites, producing output which can be combined for analysis. The problems encountered with authorization and authentication, data location, job submission, and the input and output sandboxes are described, as are the solutions. The total system is still some way short of the aims of enterprises such as the EDG, but represent a significant step along the way.

NTIS

Computer Information Security; Data Processing

20040008924 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting

Tanikawa, Masaki; Ikeda, Takashi; Ushijima, Shigehiko; Mikami, Hirohide; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 58-62; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

Although there are high hopes for broadband stream broadcasting, there are many problems to be solved, such as how to increase the capacity of the delivery server and how to reduce the operation cost, before high-quality broadcasting can be provided on a large scale and at a low cost. This article reviews stream broadcasting technologies and introduces the Live Streaming Switch being developed in 'IT Laboratories, which enables a low-cost, stable-delivery, automated streaming service.

Author

Broadband; Internets

20040008925 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications

Hanano, Shinya; Miura, Norihiro; Ushijima, Shigehiko; Mikami, Hirohide; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 63-67; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

As broadband services become widespread, various types of Internet broadcasting are emerging, such as the broadcasting of music concerts, market information, stock market news, and radio programs, especially in the business-to-business area. To meet such demands, we aim to deliver TV-like high-quality and economical video over the best-effort broadband network by applying the peer-to-peer delivery scheme. The system we have developed, which is the first of its kind in the industry, uses set-top boxes to connect TV sets to 'IT'S B-FXET's network, allowing easy delivery of live programs to shops or terminals on the street.

Author

Internets; Video Communication

20040008939 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Scalable Content Delivery Technology

Akiba, Junya; Abe, Hirofumi; NTT Technical Review; October 2003; Volume 1, No. 7, pp. 68-72; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

Our scalable content delivery system can deliver content to hundreds or thousands of sites. It uses leaf-to-leaf delivery, in which content is transferred between terminals, and on-the-fly transfer, in which content is forwarded while it is being received, to achieve high-speed and reliable content delivery to a large number of sites, which is difficult with conventional content delivery technology.

Author

Computer Networks; Video Communication

20040010478 California Univ., Berkeley, CA, USA, University of Southern California, Los Angeles, CA, USA

Application- and Network-Cognizant Proxies

Ortega, A.; Lee, D. C.; 2002; 10 pp.; In English

Report No.(s): DE2003-809088; No Copyright; Avail: Department of Energy Information Bridge

Current networks show increasing heterogeneity both in terms of their bandwidths/delays and the applications they are required to support. This is a trend that is likely to intensify in the future, as real-time services, such as video, become more widely available and networking access over wireless links becomes more widespread. For this reason they propose that

application-specific proxies, intermediate network nodes that broker the interactions between server and client, will become an increasingly important network element. These proxies will allow adaptation to changes in network characteristics without requiring a direct intervention of either server or client. In the report, particular effort was spent in studying caching techniques and on video classification to enable DiffServ delivery. Other work included analysis of traffic characteristics, optimized media scheduling, coding techniques based on multiple description coding, and use of proxies to reduce computation costs.

NTIS

Computer Networks; Data Transmission

20040010727 Titan Systems, Inc., Waltham, MA, USA

Data Intensive Systems (DIS) Benchmark Performance Summary

Musmanno, Joseph; Aug. 2003; 144 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-99-C-0153; Proj-H307

Report No.(s): AD-A418752; AFRL-IF-RS-TR-2003-198; No Copyright; Avail: CASI; [A07](#), Hardcopy

Peak processor performance increases at a rate of 60% per year, but memory access speeds increase at a rate of only 7% per year. Computing-system designers compensate for the resulting divergence by incorporating caches or latency-hiding measures into their designs. However, elements such as larger caches, prefetching, and multithreading do not address the needs of data-intensive DoD applications, which consequently operate at rates far below the peak processor-capacity. As the mismatch between processor and memory grows the number of applications unable to operate at peak rates increases. The DARPA Data Intensive Systems Program was created to address this problem. A variety of novel architectures or enhancements were developed under this program to increase the effective performance as opposed to the rated peak performance of systems running data-starved applications. Under this project, a DIS Benchmark Suite was developed to measure the performance of the prototypical systems. Additionally, the DIS Stressmark Suite was developed to assist performance measurement during the development process. Participating teams were expected to utilize these tools and supply their measurements. In this report the benchmarking tools are introduced, the reported results are summarized, and an objective analysis of the results is provided.

DTIC

Computers; Memory (Computers); Data Systems

20040010771 NASA Ames Research Center, Moffett Field, CA, USA

A Performance Evaluation of the Cray X1 for Scientific Applications

Oliker, Leonid; Biswas, Rupak; Borrill, Julian; Canning, Andrew; Carter, Jonathan; Djomehri, M. Jahed; Shan, Hongzhang; Skinner, David; November 2003; 14 pp.; In English; 6th International Meeting on High Performance Computing for Computational Science, 28-30 Jun. 2004, Valencia, Spain

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; DE-AC03-76SF-00098; WBS 302-15-41; No Copyright; Avail: CASI; [A03](#), Hardcopy

The last decade has witnessed a rapid proliferation of superscalar cache-based microprocessors to build high-end capability and capacity computers because of their generality, scalability, and cost effectiveness. However, the recent development of massively parallel vector systems is having a significant effect on the supercomputing landscape. In this paper, we compare the performance of the recently-released Cray X1 vector system with that of the cacheless NEC SX-6 vector machine, and the superscalar cache-based IBM Power3 and Power4 architectures for scientific applications. Overall results demonstrate that the X1 is quite promising, but performance improvements are expected as the hardware, systems software, and numerical libraries mature. Code reengineering to effectively utilize the complex architecture may also lead to significant efficiency enhancements.

Author

Cray Computers; Performance Tests; Applications Programs (Computers); Vector Processing (Computers); Architecture (Computers)

20040010817 NASA Ames Research Center, Moffett Field, CA, USA

A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms

Sanyal, Soumya; Jain, Amit; Das, Sajal K.; Biswas, Rupak; November 1, 2003; 4 pp.; In English; IEEE 5th International Conference on Cluster Computing, 1-4 Dec. 2003, Hong Kong, China

Contract(s)/Grant(s): NCC2-5395; WBS 302-15-41; No Copyright; Avail: CASI; [A01](#), Hardcopy

In this paper, we propose a distributed approach for mapping a single large application to a heterogeneous grid environment. To minimize the execution time of the parallel application, we distribute the mapping overhead to the available nodes of the grid. This approach not only provides a fast mapping of tasks to resources but is also scalable. We adopt a hierarchical grid model and accomplish the job of mapping tasks to this topology using a scheduler tree. Results show that our three-phase algorithm provides high quality mappings, and is fast and scalable.

Author

Genetic Algorithms; Computational Grids; Mathematical Models; Conformal Mapping; Heterogeneity; Distributed Processing; Applications Programs (Computers)

20040010818 Computer Sciences Corp., USA

Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications

Ayguade, Eduard; Gonzalez, Marc; Martorell, Xavier; Jost, Gabriele; April 26, 2004; 17 pp.; In English; International Parallel and Distributed Processing Symposium, Apr. 2004, Santa Fe, NM, USA

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; CICYT-98-511; Copyright; Avail: CASI; [A03](#), Hardcopy

In this paper we describe the parallelization of the multi-zone code versions of the NAS Parallel Benchmarks employing multi-level OpenMP parallelism. For our study we use the NanosCompiler, which supports nesting of OpenMP directives and provides clauses to control the grouping of threads, load balancing, and synchronization. We report the benchmark results, compare the timings with those of different hybrid parallelization paradigms and discuss OpenMP implementation issues which effect the performance of multi-level parallel applications.

Author

Computational Fluid Dynamics; Parallel Processing (Computers); Architecture (Computers); Compilers; Applications Programs (Computers)

20040010841 Naval Postgraduate School, Monterey, CA, USA

Execution-Based Model Checking of Interrupt-Based Systems

Drusinsky, Doron; Havelund, Klaus; [2003]; 4 pp.; In English; International Conference on Dependable Systems and Networks and Networks Workshop on Model Checking; Copyright; Avail: CASI; [A01](#), Hardcopy

Execution-based model checking (EMC) is a verification technique based on executing a multi-threaded/multiprocess program repeatedly in a systematic manner in order to explore the different interleavings of the program. This is in contrast to traditional model checking, where a model of a system is analyzed. Several execution-based model-checking tools exist at this point, such as for example Verisoft and Java PathFinder. The most common formal specification languages used by EMC tools are un-timed, either just assertions, or linear-time temporal logic (LTL). An alternative verification technique is Runtime Execution Monitoring (REM), which is based on monitoring the execution of a program, checking that the execution trace conforms to a requirement specification. The Temporal Rover and DBRover are such tools. They provide a very rich specification language, being an extension of LTL with real-time constraints and time-series. We show how execution-based model checking, combined with runtime execution monitoring, can be used for the verification of a large class of safety critical systems commonly known as interrupt-based systems. The proposed approach is novel in that: (i) it supports model checking of a large class of applications not practically verifiable using conventional EMC tools, (ii) it supports verification of LTL assertions extended with real-time and time-series constraints, and (iii) it supports the verification of custom schedulers.

Author

Temporal Logic; Mathematical Models; Program Verification (Computers); Computer Systems Programs; Operating Systems (Computers)

20040010873 Colorado Univ., Boulder, CO

Precision Structural Mechanics Instrumentation System

Hinkle, Jason; Aug. 24, 2003; 7 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0200

Report No.(s): AD-A418971; AFRL-SR-AR-TR-03-0500; No Copyright; Avail: CASI; [A02](#), Hardcopy

This document is a report of work done under Air Force Office of Scientific Research (AFOSR) award number F49620-02-1-0200 entitled 'Precision Structural Mechanics Instrumentation System' under the Defense University Research Instrumentation Program (DURIP). This document summarizes the instrumentation and data acquisition equipment acquired via this grant. The central signal conditioning and digitizing subsystem equipment was acquired as proposed with only minor

upgrade exceptions. A newly available upgrade of the interferometry subsystem was accommodated within the budget by reducing the quantity of accelerometers which were acquired. The document also references both Air Force and NASA funded research impacted by this instrumentation system. Document Organization This report is organized as follows. Section 2 describes the acquired instruments and data acquisition equipment which was integrated as the precision structural mechanics instrumentation, on system. Section 3 references research projects which have already been affected by this instrumentation system. Section 4 summarizes the outcome of the instrumentation acquisition enabled by this grant.

DTIC

Data Acquisition; Sound Detecting and Ranging; Structural Members; Signal Processing; Accelerometers

20040012598 NASA Ames Research Center, Moffett Field, CA, USA

EAGLE can do Efficient LTL Monitoring

Barringer, Howard; Goldberg, Allen; Havelund, Klaus; Sen, Koushik; [; 16 pp.; In English; Fossacs Ortacas, 27 Mar. - 4 Apr. 2004, Barcelona, Spain

Contract(s)/Grant(s): GR/S40435/01; Copyright; Avail: CASI; [A03](#), Hardcopy

We briefly present a rule-based framework, called EAGLE, that has been shown to be capable of defining and implementing finite trace monitoring logics, including future and past time temporal logic, extended regular expressions, real-time logics, interval logics, forms of quantified temporal logics, and so on. In this paper we show how EAGLE can do linear temporal logic (LTL) monitoring in an efficient way. We give an upper bound on the space and time complexity of this monitoring.

Author

Temporal Logic; Program Verification (Computers); Computer Systems Programs; Linear Systems

20040012676 NASA Ames Research Center, Moffett Field, CA, USA

Rule-Based Runtime Verification

Barringer, Howard; Goldberg, Allen; Havelund, Klaus; Sen, Koushik; [2003]; 12 pp.; In English; Fifth International Conference on Verification, Model Checking and Abstract Interpretation, 11-13 Jan. 2004, Venice, Italy; Copyright; Avail: CASI; [A03](#), Hardcopy

We present a rule-based framework for defining and implementing finite trace monitoring logics, including future and past time temporal logic, extended regular expressions, real-time logics, interval logics, forms of quantified temporal logics, and so on. Our logic, EAGLE, is implemented as a Java library and involves novel techniques for rule definition, manipulation and execution. Monitoring is done on a state-by-state basis, without storing the execution trace.

Author

Temporal Logic; Program Verification (Computers); Run Time (Computers); Linear Systems; Computer Programs

63

CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20040008563 Carnegie-Mellon Univ., Pittsburgh, PA

Effective Coordination of Multiple Intelligent Agents for Command and Control

Sycara, Katia; Giampapa, Joseph; Rectenwald, Michael D.; Sep. 2003; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-98-2-0138; Proj-AGEN

Report No.(s): AD-A418696; AFRL-IF-RS-TR-2003-218; No Copyright; Avail: CASI; [A03](#), Hardcopy

RETSINA (REusable Task-based System of Intelligent Network Agents) is an open Multi-Agent System (MAS) in which heterogeneous agents engage in relations with the support of distributed infrastructure services. The goal of RETSINA project has been to provide the necessary infrastructure and agent types to allow an open system of agents whose interactions are facilitated rather than managed by infrastructure components. Another goal has been to create autonomous software agents functioning robustly in distributed environments, agents that are reusable in different application contexts, and that respond intelligently to changes in their environments. This development of a flexible, extensible and decentralized MAS is consistent with the shared vision of an interactive World Wide Web of Services (WWWS), a dynamic web where software agents act autonomously and cooperatively to effect changes in their environments, performing numerous and complex tasks for their human counterparts. RETSINA is scalable system designed to support individual users and teams of users in utilizing the

results of information gathering and fusion for decision support, task management, cooperative interaction, and many other functions, in an open and dynamic environment, eventually to encompass the World Wide Web. In RETSINA, multiple agents cooperate to process user requests appropriately and flexibly, matching them to information sources that may be distributed over the Internet and other accessible information environments, such as intranets or other databases.

DTIC

Computer Programs; Command and Control

20040008834 Washington Univ., Seattle, WA, USA

A Visual Database System for Image Analysis on Parallel Computers and its Application to the EOS Amazon Project

Shapiro, Linda G.; Tanimoto, Steven L.; Ahrens, James P.; October 1996; 47 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-21; No Copyright; Avail: CASI; [A03](#), Hardcopy

The goal of this task was to create a design and prototype implementation of a database environment that is particular suited for handling the image, vision and scientific data associated with the NASA's EOC Amazon project. The focus was on a data model and query facilities that are designed to execute efficiently on parallel computers. A key feature of the environment is an interface which allows a scientist to specify high-level directives about how query execution should occur.

Author

Data Bases; Image Analysis; Parallel Computers; Earth Observing System (Eos); NASA Programs

20040008849 Florida International Univ., Miami, FL, USA

Expert Seeker: A People-Finder Knowledge Management System

Becerra-Fernandez, Irma; [2000]; 35 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-97-74; NAG10-0259; No Copyright; Avail: CASI; [A03](#), Hardcopy

The first objective for this report was to perform a comprehensive research of industry models currently being used for similar purposes, in order to provide the Center with ideas of what is being done in area by private companies and government agencies. The second objective was to evaluate the use of taxonomies or ontologies to describe and catalog the areas of expertise at GSFC. The creation of a knowledge taxonomy is necessary for information extraction in order for The Expert Seeker to adequately search and find experts in a particular area of expertise. The requirements to develop a taxonomy are: provide minimal descriptive text; have the appropriate level of abstraction; facilitate browsing; ease of use and speed of data entry are critical for success; customized to the organization and its culture; extent of knowledge areas; expandable, so new skills could be develop; could be complemented with free text fields to allow users the option to describe their knowledge in detail.

Author

Taxonomy; Computer Programs; Artificial Intelligence; Expert Systems

20040008887 NASA Glenn Research Center, Cleveland, OH, USA

Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation

Litt, Jonathan S.; Wong, Edmond; Krasowski, Michael J.; Greer, Lawrence C.; November 2003; 11 pp.; In English; International Conference on Integration of Knowledge Intensive Multi-Agent Systems, 1-3 Oct. 2003, Cambridge, MA, USA

Contract(s)/Grant(s): WBS 22-708-87-08; DA Proj. 1L1-61102-AF-20

Report No.(s): NASA/TM-2003-212708; E-14218; ARL-TR-3054; No Copyright; Avail: CASI; [A03](#), Hardcopy

Cooperative behavior algorithms utilizing swarm intelligence are being developed for mobile sensor platforms to inspect jet engines on-wing. Experiments are planned in which several relatively simple autonomous platforms will work together in a coordinated fashion to carry out complex maintenance-type tasks within the constrained working environment modeled on the interior of a turbofan engine. The algorithms will emphasize distribution of the tasks among multiple units; they will be scalable and flexible so that units may be added in the future; and will be designed to operate on an individual unit level to produce the desired global effect. This proof of concept demonstration will validate the algorithms and provide justification for further miniaturization and specialization of the hardware toward the true application of on-wing in situ turbine engine maintenance.

Author

Turbofan Engines; Inspection; Sensors; Autonomy; Miniaturization; Aircraft Maintenance

20040010815 QSS Group, Inc., Moffett Field, CA, USA, QSS Group, Inc., Moffett Field, CA, USA, QSS Group, Inc., Moffett Field, CA, USA, QSS Group, Inc., Moffett Field, CA, USA

Mission Simulation Facility: Simulation Support for Autonomy Development

Pisanich, Greg; Plice, Laura; Neukom, Christian; Flueckiger, Lorenzo; Wagner, Michael; [2003]; 8 pp.; In English; AIAA Aerospace Sciences Meeting: Intelligent Systems II Session, Jan. 2004, Reno, NV, USA; No Copyright; Avail: CASI; [A02](#), Hardcopy

The Mission Simulation Facility (MSF) supports research in autonomy technology for planetary exploration vehicles. Using HLA (High Level Architecture) across distributed computers, the MSF connects users autonomy algorithms with provided or third-party simulations of robotic vehicles and planetary surface environments, including onboard components and scientific instruments. Simulation fidelity is variable to meet changing needs as autonomy technology advances in Technical Readiness Level (TRL). A virtual robot operating in a virtual environment offers numerous advantages over actual hardware, including availability, simplicity, and risk mitigation. The MSF is in use by researchers at NASA Ames Research Center (ARC) and has demonstrated basic functionality. Continuing work will support the needs of a broader user base.

Author

Autonomy; Computerized Simulation; Space Missions; Robotics; Roving Vehicles

20040012708 NASA Ames Research Center, Moffett Field, CA, USA

Scoping Planning Agents With Shared Models

Bedrax-Weiss, Tania; Frank, Jeremy D.; Jonsson, Ari K.; McGann, Conor; October 27, 2003; 8 pp.; In English; 14th International Conference on Automated Planning and Scheduling, Jun. 2003, Canada; Copyright; Avail: CASI; [A02](#), Hardcopy

In this paper we provide a formal framework to define the scope of planning agents based on a single declarative model. Having multiple agents sharing a single model provides numerous advantages that lead to reduced development costs and increase reliability of the system. We formally define planning in terms of extensions of an initial partial plan, and a set of flaws that make the plan unacceptable. A Flaw Filter (FF) allows us to identify those flaws relevant to an agent. Flaw filters motivate the Plan Identification Function (PIF), which specifies when an agent is ready hand control to another agent for further work. PIFs define a set of plan extensions that can be generated from a model and a plan request. FFs and PIFs can be used to define the scope of agents without changing the model. We describe an implementation of PIFs and FFs within the context of EUROPA, a constraint-based planning architecture, and show how it can be used to easily design many different agents.

Author

Mathematical Models; Architecture (Computers); Computer Systems Programs; Artificial Intelligence; Planning

64

NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20040010459 Swedish Defence Research Establishment, Stockholm, Sweden

Recursive Terrain Navigation. Application of the Correlation Method

Nygren, I.; Aug. 2002; In Swedish

Report No.(s): PB2004-101521; FOI-R-0763-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the use of the correlation method in the recursive estimation of the position of an underwater vehicle. It also discusses the improved robustness and accuracy achieved by the correlation method. Further it describes a Hardware Correlator which calculates a Terrain Position in 255 ms.

NTIS

Underwater Vehicles; Position (Location); Correlation

20040010810 Defence Evaluation Research Agency, Bedford, UK

An Experimental and Computational Study of the Aerodynamics of a Square Cross-Section Body at Supersonic Speeds

Birch, Trevor J.; Prince, Simon A.; Simpson, Graham M.; Mar. 2003; 15 pp.; In English; Original contains color illustrations Report No.(s): AD-A418849; SYA-3-1; No Copyright; Avail: CASI; [A03](#), Hardcopy

An experimental and computational study has been carried out to investigate the aerodynamic characteristics of a square cross-section body at supersonic speeds. The results show that a square cross-section body generates higher normal force and offers improved lift-to-drag ratios when compared with conventional circular cross-section bodies for certain preferred

orientations. However it was found that square cross-section bodies can also generate significant lateral forces and moments, and very complicated leeside vortical flowfields which complicate the missile control system. A Parabolized Navier-Stokes solver was successfully employed to predict the forces and moments, and provided added valuable insight into the complex vortical flows which develop on the leeside of bodies at incidence.

DTIC

Aerodynamic Characteristics; Supersonic Speed; Cross Sections

20040010829 Massachusetts Inst. of Tech., Cambridge, MA

From Materials to Missions Assess-Predict-Optimize: A Computational Approach to Adaptive Design

Patera, Anthony T.; Jan. 2001; 11 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0458

Report No.(s): AD-A418927; AFRL-SR-AR-TR-03-0511; No Copyright; Avail: CASI; [A03](#), Hardcopy

We develop an Assess-Predict-Optimize (APO) strategy for the adaptive design of optimal missions for critical components and systems. We first Assess the system - through non-destructive inverse procedures for evaluating the system characteristics of interest: this yields the many possible realizations of the system. We then Predict future behavior of the system - through various modeling and computational procedures: this translates the uncertainties in system characterization into ranges of performance. Finally, we Optimize the system mission - through mathematical programming methods: this provides the best possible configuration and deployment schedule relative to the design objectives and now-identified (but uncertain) system characteristics. The essential mathematical ingredients of our approach are twofold. First, we employ Reduced-Basis Output Bound Methods: dimension reduction - the rational construction of highly efficient ('real-time' response) system-specific approximation spaces that reflect the low-dimensional parametric manifold on which a component 'evolves' during design and operation; and a posteriori error estimation - relaxation of the classical error-residual equality that provide inexpensive bounds for the prediction error. Second, we employ Mathematical Programming Methods: techniques which incorporate our reduced-basis output bounds for efficient minimization of objective functions with strict adherence to constraints even in the presence of uncertainty.

DTIC

Optimization; Computation; Design Analysis; Adaptive Control

20040010833 Air Force Inst. of Tech., Wright-Patterson AFB, OH

A Sounding Rocket Attitude Determination Algorithm Suitable for Implementation Using Low Cost Sensors

Charlton, Mark C.; Dec. 2003; 335 pp.; In English

Report No.(s): AD-A418935; AFIT-CI02-1331; No Copyright; Avail: CASI; [A15](#), Hardcopy

The development of low-cost sensors has generated a corresponding movement to integrate them into many different applications. One such application is determining the rotational attitude of an object. Since many of these low-cost sensors are less accurate than their more expensive counterparts, their noisy measurements must be filtered to obtain optimum results. This work describes the development, testing, and evaluation of four filtering algorithms for the nonlinear sounding rocket attitude determination problem. Sun sensor, magnetometer, and rate sensor measurements are simulated. A quaternion formulation is used to avoid singularity problems associated with Euler angles and other three-parameter approaches. Prior to filtering, Gauss-Newton error minimization is used to reduce the six reference vector components to four quaternion components that minimize a quadratic error function. Two of the algorithms are based on the traditional extended Kalman filter (EKF) and two are based on the recently developed unscented Kalman filter (UKF). One of each incorporates rate measurements, while the others rely on differencing quaternions. All incorporate a simplified process model for state propagation allowing the algorithms to be applied to rockets with different physical characteristics, or even to other platforms. Simulated data are used to develop and test the algorithms, and each successfully estimates the attitude motion of the rocket, to varying degrees of accuracy. The UKF-based filter that incorporates rate sensor measurements demonstrates a clear performance advantage over both EKFs and the UKF without rate measurements. This is due to its superior mean and covariance propagation characteristics and the fact that differencing generates noisier rates than measuring. For one sample case, the 'pointing accuracy' of the rocket spin axis is improved by approximately 39 percent over the EKF that uses rate measurements and by 40 percent over the UKF without rates.

DTIC

Sounding Rockets; Algorithms; Attitude (Inclination); Kalman Filters; Finite Difference Theory

20040012574 New York Univ., New York, NY

Cartesian and Adaptive Methods for Complex Geometries

Berger, Marsha J.; May 2002; 7 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0099

Report No.(s): AD-A419002; AFRL-SR-AR-TR-03-0514; No Copyright; Avail: CASI; [A02](#), Hardcopy

Two major efforts are in progress this year. The first is on-going development of solution adaptive mesh refinement for use with Cartesian embedded boundary meshes, the second effort is developing numerical methods for time dependent flows, including moving geometrics. This includes on-going work in collaboration with Scott Murman at NASA Ames, using a dual time stepping approach that builds on our previous research developing a steady state flow solver. In a new collaboration with Christiane Helzel, postdoctoral student at the Courant Institute. We are trying to more fully understand the accuracy and stability issues of irregular grids, and develop explicit finite volume schemes that use time steps based on the full cell volumes.

DTIC

Computational Grids; Geometry

20040012633 Pennsylvania State Univ., University Park, PA

Multiobject Robust Control of Nonlinear Systems via State Dependent Coefficient Representations and Applications

Sznaier, Mario; Jan. 2000; 14 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0020

Report No.(s): AD-A419042; AFRL-SR-AR-TR-03-0490; No Copyright; Avail: CASI; [A03](#), Hardcopy

These past few years have seen a significant change in the roles and requirements of the U.S. Air Force. On the one hand, the well defined global threat posed by a few conventional and nuclear forces has been replaced by multiple, localized potential threats that in addition to the usual conventional and nuclear ones, also potentially involve chemical and biological weapons. In addition, the USAF role has expanded to include operations other than warfare, such as peacekeeping and humanitarian aid. Finally, limited resources mandate that these roles must be achieved in a cost-effective way. This scenario translates into a requirement for highly versatile systems, capable of delivering near optimal performance under a wide range of conditions. In tills research we have developed a framework, based on the combination of Receding Horizon, Control Lyapunov Functions and Operator Interpolation Theory techniques, for systematically designing controllers capable of meeting these challenges. These controllers offer the following advantages over hitherto available design methods: The ability to deliver near optimal performance while keeping the computational complexity compatible with an on-line implementation.

DTIC

Control; Nonlinear Systems; On-Line Systems; Liapunov Functions; Applications of Mathematics

20040012650 NASA Ames Research Center, Moffett Field, CA, USA

Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability

Knuth, Kevin H.; Shah, Ankoor S.; Truccolo, Wilson; Ding, Ming-Zhou; Bressler, Steven L.; Schroeder, Charles E.; October 08, 2003; 42 pp.; In English

Contract(s)/Grant(s): NIGMS-T-32-M07288; NIMH-MH-060358; NSF IBN-00-90717; NIMH-MH-64204; NIMH-MH-42900; Copyright; Avail: CASI; [A03](#), Hardcopy

Electric potentials and magnetic fields generated by ensembles of synchronously active neurons in response to external stimuli provide information essential to understanding the processes underlying cognitive and sensorimotor activity. Interpreting recordings of these potentials and fields is difficult as each detector records signals simultaneously generated by various regions throughout the brain. We introduce the differentially Variable Component Analysis (dVCA) algorithm, which relies on trial-to-trial variability in response amplitude and latency to identify multiple components. Using simulations we evaluate the importance of response variability to component identification, the robustness of dVCA to noise, and its ability to characterize single-trial data. Finally, we evaluate the technique using visually evoked field potentials recorded at incremental depths across the layers of cortical area VI, in an awake, behaving macaque monkey.

Derived from text

Algorithms; Evoked Response (Psychophysiology); Bioelectric Potential; Magnetic Fields; Electric Fields

20040012670 NASA Marshall Space Flight Center, Huntsville, AL, USA

Analytic Solution to the Problem of Aircraft Electric Field Mill Calibration

Koshak, William; [2003]; 1 pp.; In English; Fall American Geophysical Union Conference, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

It is by no means a simple task to retrieve storm electric fields from an aircraft instrumented with electric field mill sensors. The presence of the aircraft distorts the ambient field in a complicated way. Before retrievals of the storm field can be made, the field mill measurement system must be 'calibrated'. In other words, a relationship between impressed (i.e., ambient) electric field and mill output must be established. If this relationship can be determined, it is mathematically inverted so that ambient field can be inferred from the mill outputs. Previous studies have primarily focused on linear theories where the relationship between ambient field and mill output is described by a 'calibration matrix' M . Each element of the matrix describes how a particular component of the ambient field is enhanced by the aircraft. For example the product $M(\text{sub } ix)$, $E(\text{sub } x)$, is the contribution of the $E(\text{sub } x)$ field to the $i(\text{th})$ mill output. Similarly, net aircraft charge (described by a 'charge field component' $E(\text{sub } q)$) contributes an amount $M(\text{sub } iq)E(\text{sub } q)$ to the output of the $i(\text{th})$ sensor. The central difficulty in obtaining M stems from the fact that the impressed field ($E(\text{sub } x)$, $E(\text{sub } y)$, $E(\text{sub } z)$, $E(\text{sub } q)$) is not known but is instead estimated. Typically, the aircraft is flown through a series of roll and pitch maneuvers in fair weather, and the values of the fair weather field and aircraft charge are estimated at each point along the aircraft trajectory. These initial estimates are often highly inadequate, but several investigators have improved the estimates by implementing various (ad hoc) iterative methods. Unfortunately, none of the iterative methods guarantee absolute convergence to correct values (i.e., absolute convergence to correct values has not been rigorously proven). In this work, the mathematical problem is solved directly by analytic means. For m mills installed on an arbitrary aircraft, it is shown that it is possible to solve for a single $2m$ -vector that provides all other needed variables (i.e., the unknown fair weather field, the unknown aircraft charge, and the unknown matrix M). Numerical tests of the solution, effects of measurement errors, and studies of solution non-uniqueness are ongoing as of this writing.

Author

Numerical Analysis; Electric Fields; Iterative Solution; Estimates; Calibrating

65

STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20040010721 Naval Surface Warfare Center, Indian Head, MD, USA

A Bayesian Model for the Analysis of Quantal Response Data

McDonald, William W.; May 5, 2003; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-N0001499WX301410

Report No.(s): AD-A418744; NSWC-IHTR-2503; No Copyright; Avail: CASI; [A03](#), Hardcopy

Inference on the failure probabilities of ordered binomial trials conducted at M differing stress levels is considered. It is shown that a general joint prior may be constructed as a mixture of ordered M variate Dirichlet distributions, which possesses marginals of nearly arbitrary shapes. Posterior marginals at both observational and non-observational stresses are shown to consist of sums of beta distributions. Recursive relationships are developed that permit the rapid and exact computation of the posterior marginal distributions. The model is attractive for use in successive Bayesian analyses.

DTIC

Bayes Theorem; Probability Theory

20040010722 Naval Surface Warfare Center, Indian Head, MD, USA

MBR-A Computer Program for Performing Nonparametric Bayesian Analyses of Ordered Binomial Data

McDonald, William W.; May 2, 2003; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-N0001499WX301410

Report No.(s): AD-A418745; NSWC-IHTR-2323; No Copyright; Avail: CASI; [A03](#), Hardcopy

The MBR computer program computes posterior marginal distributions for binomial response probabilities associated with a set of M -ordered stresses or stimuli. Exact solutions are achieved of the posterior marginal distribution functions, first published by Disch, which was based on Ramsey's M -variate ordered Dirichlet joint prior. MBR assumes a related joint prior that is a mixture of Dirichlet distributions to obtain a class capable of representing arbitrary and quite general forms. The joint prior distribution is reconstructed from three percentile curves, such as the 10th, 50th, and 90th percentiles, of the prior marginal distributions as assigned by an expert. The code then calculates the posterior marginal distributions (mixtures of beta distributions) and constructs new percentile curves that reflect the effect of the data upon the priors in accordance with Bayes

s law. Rapid and exact solutions are obtained by means of a recursive theory developed by the author.
DTIC

Bayes Theorem; Binomials; Probability Theory; Distribution Functions

20040012607 Naval Surface Warfare Center, Bethesda, MD, USA

Are the Energy Analysis (EA) and the Statistical Energy Analysis (SEA) compatible?

Maidanik, G.; Becker, K. J.; Nov. 2003; 26 pp.; In English

Report No.(s): AD-A419012; NSWCCD-70-TR-2003/115; No Copyright; Avail: CASI; [A03](#), Hardcopy

Originally the statistical energy analysis (SEA) was restricted to a low coupling loss factor, at least, lower than the loss factor of the (adjunct) dynamic system to which the externally driven (master) dynamic system was coupled. The coupling loss factor of reference is that from the adjunct dynamic system to the master dynamic system. With the advent of structural fuzzies, as introduced by Soize and subsequently interpreted by a number of researchers, questions relating not only to the validity of the conservation of energy arose, but also arose were questions relating to the coupling loss factors, to the loss factors and to the external input powers. In trying to decipher, in terms of (SEA), some of these questions, a number of surprising answers emerged which casts doubts on the universal validity of (SEA). In small part this report attempts to warn the noise control engineers that as valuable as (SEA) is, it has fundamental limitations and that these limitations are not merely and strictly a question of frequency regions; i.e., high-, mid- and low-frequencies.

DTIC

Statistical Analysis; Fluid Dynamics; Energy Conservation

66

SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20040008564 Military Academy, West Point, NY

Research Plan of the Operations Research Center and Department of Systems Engineering for Academic Year 2004

Kwinn, Michael J., Jr.; Klimack, William K.; Kaufman, Daniel J., Jr.; Sep. 2003; 93 pp.; In English

Report No.(s): AD-A418694; No Copyright; Avail: CASI; [A05](#), Hardcopy

The purpose of this document is to formalize the research and problem-solving activities of the U.S. Military Academy Operations Research Center for Excellence (ORCEN) for the upcoming academic year. The research plan includes a statement of purpose for the ORCEN, a description of its organization, a list of the key personnel responsible for executing the plan, and an overview of the annual research cycle. These are followed by a concise summary of each applied research or problem-solving project. The summary includes a problem statement, a proposed methodology for project execution, project requirements and deliverables, estimates of milestones, and the number of man-years required to complete the work. Additional information is provided on the senior investigator, principal analyst, the client organization, and points of contact. The ORCEN serves as the coordinating body for all research undertaken within the Department of Systems Engineering. As such, this plan encompasses a range of projects and work performed by ORCEN Analysts, Sr. and other Faculty members and Cadets alike. These research activities are opportunities to develop research and problem-solving skills while working on problems that are of importance to today's Army.

DTIC

Operations Research; Research Management; Systems Engineering

20040010656 Naval Postgraduate School, Monterey, CA

Modeling and Analysis of Uncertain Time-Critical Tasking Problems (UTCTP)

Gaver, Donald P., Jr.; Jacobs, Patricia A.; Samorodnitsky, Gennady; Nov. 2003; 39 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418762; NPS-OR-03-005; No Copyright; Avail: CASI; [A03](#), Hardcopy

We consider modeling and operational analysis of a generic asymmetric service-system situation in which (a) Red agents, potentially threatening, but possibly requiring assistance, arrive according to some partially known and possibly changing pattern in time and space; and (b) Reds are impatient: have effectively limited unknown deadlines or times of availability for Blue service, i.e., detection, classification, and attack in a military setting, or emergency assistance in other settings, such as medical care. We discuss various service options by Blue service agents and devise several approximations allowing one to compute efficiently proportions of tasks of different types that are successfully served or, more generally, if different rewards

are associated with different types of tasks, the percentage of the possible reward gained. We suggest a heuristic policy for a Blue server to select the next task to perform and to decide how much time to allocate to that service. We discuss this and related policies for a number of specific examples.

DTIC

Emergencies; Heuristic Methods; Real Time Operation

20040010659 Net Exchange, San Diego, CA, USA

Pre-Game-Theory Based Information Technology (GAMBIT) Study

Polk, Charles; Oct. 2003; 84 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-02-C-0078; Proj-N229

Report No.(s): AD-A419186; AFRL-IF-RS-TR-2003-243; No Copyright; Avail: CASI; [A05](#), Hardcopy

DARPA sees potential value in a strategic reasoning simulation tool-tentatively named GAMBIT (Game-Theory Based Information Technology). Net Exchange has completed a GAMBIT feasibility study. The study involved characterizing tool requirements, determining the readiness of game theory and IT, demonstrating a historical case in a GAMBIT-like scenario, and recommending a development path forward. The generic GAMBIT scenario has been characterized as Dynamic Hierarchical Gaming (DHG). Game theory is not yet ready to fully support analysis of DHG, though existing partial analysis suggests that a full treatment is practical in the midterm. IT is generally ready to support development of a GAMBIT tool with the critical exception of software agents with sufficient strategic reasoning capability - a good deal of development is required here. Management of R&D among the developers of science instruments for a planetary mission was demonstrated in a distributed software agent environment. The demonstration results from this GAMBIT-like scenario were in accord with observed history. The Diplomacy Test Utility (DTU) has been identified as a path forward. The DTU starts with a known scenario that can be expanded to DHG through a process supported by theory and tested by human play.

DTIC

Game Theory; Information Systems; Systems Analysis; Computerized Simulation

67

THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20040010808 Naval Research Lab., Washington, DC

Proceedings STRATA 2003. First International Workshop on Design and Application of Strategies/Tactics in Higher Order Logics; Focus on PVS experiences

Archer, Myla M.; DiVito, Ben L.; Munoz, Cesar; Nov. 28, 2003; 116 pp.; In English

Contract(s)/Grant(s): Proj-55-8420-03

Report No.(s): AD-A418902; NRL/MR/5540-03-8722; No Copyright; Avail: CASI; [A06](#), Hardcopy

This report contains the Proceedings of STRATA 2003, the First International Workshop on the Design and Application of Strategies/Tactics in Higher Order Logics. In contrast to the Strategies in Automated Deduction workshop series that is associated with CADE (the International Conference on Automated Deduction), STRATA focuses on theorem proving strategies for higher order logic theorem provers rather than on theorem proving strategies for (primarily) first order logic theorem proving. This first STRATA workshop focuses in particular on PVS experiences. The Proceedings contains both a paper on strategy writing from the PVS developers and a tutorial on strategy writing written by the editors. It also contains a set of papers presented at STRATA 2003 by users of PVS and other higher order logic provers.

DTIC

Mathematical Logic; Theorem Proving

20040010864 Level Set Systems, Inc., Pacific Palisades, CA, USA

Dynamic RCS: A Geometrical/Eulerian Approach to Computing High Frequency Radar Cross Sections

Osher, Stanley; Steinhoff, John; Jan. 2001; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-01-1-0189

Report No.(s): AD-A418924; LSS-03F; AFRL-SR-AR-TR-03-0492; No Copyright; Avail: CASI; [A03](#), Hardcopy

Level Set Systems (LSS) has developed a 3D- Eulerian, time-domain method for computing the propagation and scattering of short electromagnetic pulses over arbitrarily long distances. Efforts accommodated includes variation of index of refraction and scattering from complex features including tanks and aircraft. LSS developed a level set method for the

construction of wavefronts that handles resolution, multivalued solutions, reflection and refraction. The key idea involves an Eulerian, fixed grid solver involving a system of linear Liouville equations, three equations in five space dimensions. The complexity of each update is no worse than that of ray tracing because of the use of a new local level set method for high dimension and codimension. This allows this level set method to be a viable alternative to ray tracing with many advantages for realistic DOD applications involving geometric optics. Flow Analysis Inc (FAI) has developed a lattice confinement method that has been shown to be effective for propagating short pulses as nonlinear solitary waves over long distances. These two methods complement each other and lay the foundation for greatly improved Radar Cross Section computations.

DTIC

Radar Cross Sections; Euler Equations of Motion; Time Domain Analysis

70

PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics*, *90 Astrophysics*, or *92 Solar Physics*.

20040008848 Stanford Linear Accelerator Center, Stanford, CA, USA, Siegen Univ., Germany, Technische Hochschule, Darmstadt, Germany, European Organization for Nuclear Research, Geneva, Switzerland

WOPPER, Version 1.1: A Monte Carlo Event Generator for Four Fermion Production at LEP-II and Beyond

Anlauf, H.; Dahmen, H. D.; Himmler, A.; Manakos, P.; Mannel, T.; 1994; 10 pp.; In English

Report No.(s): DE2003-813291; SLAC-PUB-10036; No Copyright; Avail: Department of Energy Information Bridge

We report on the status of the Monte Carlo event generator WOPPER. Version 1.1 of WOPPER describes four fermion production at LEP-II and beyond with leading logarithmic radiative corrections in the double W plus or minus pole approximation. These approximations are appropriate for almost all practical purposes, but the inclusion of these definite width effects and radiative corrections is nevertheless indispensable for LEP-II physics.

NTIS

Fermions; Monte Carlo Method

20040008851 Stanford Linear Accelerator Center, Stanford, CA, USA, National Lab. for High Energy Physics, Oho, Japan, European Organization for Nuclear Research, Geneva, Switzerland

Symplectic Beam-Beam Interaction with Energy Change

Hirata, K.; Moshhammer, H.; Ruggiero, F.; 2003; 28 pp.; In English

Report No.(s): DE2003-813308; SLAC-PUB-10055; No Copyright; Avail: Department of Energy Information Bridge

The performance of many colliding storage rings is limited by the beam-beam interaction. A particle feels a nonlinear force produced by the encountering bunch at the collision. This beam-beam force acts mainly in the transverse directions so that the longitudinal effects have scarcely been studied, except for the cases of a collision with a crossing angle. Recently, however, high luminosity machines are being considered where the beams are focused extensively at the interaction point (IP) so that the beam sizes can vary significantly within the bunch length.

NTIS

Beam Interactions; Storage Rings (Particle Accelerators)

20040008855 Stanford Linear Accelerator Center, Stanford, CA, USA, European Organization for Nuclear Research, Geneva, Switzerland, Deutsches Elektronen-Synchrotron, Hamburg, Germany

Comparative Assessment of Simulation Tools for Beam Delivery Systems of Linear Colliders

Redaelii, S.; ABmann, R.; Burkhardt, H.; Schulte, D.; Zimmermann, F.; Jul. 2003; 10 pp.; In English

Report No.(s): DE2003-813320; SLAC-PUB-10069; No Copyright; Avail: Department of Energy Information Bridge

In this paper, simulation codes for Beam Delivery Systems in linear colliders are discussed. Several tracking codes are available for particle tracking. They do not normally include precise calculation of the beam-beam effect, with accounting for pinch, hour-glass, pair production. They provide instead the particle distributions at the interaction point, after tracking through the different components of the linear collider. Other simulation programs must be used to compute precisely the beam-beam interaction. The traditional approach is to use the output bunches from the tracking codes as input for the beam-beam programs. Several tools suitable for advanced luminosity studies are presented. The use of these codes is put into

perspective, treating in detail the example of the Compact Linear Collider (CLIC) beam delivery system (3 TeV option).
NTIS

Beam Interactions; Computerized Simulation

20040008856, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Verge of One Petabyte: The Story Behind the BaBar Database

Adesanya, A.; Azemoon, T.; Becia, J.; Hanushevsky, A.; Hasan, A.; 2003; 10 pp.; In English

Report No.(s): DE2003-813344; SLAC-PUB-9889; No Copyright; Avail: Department of Energy Information Bridge

The BaBar database has pioneered the use of a commercial ODBMS within the HEP community. The unique object-oriented architecture of Objectivity/DB has made it possible to manage over 700 terabytes of production data generated since May'99, making the BaBar database the world's largest known database. The ongoing development includes new features, addressing the ever-increasing luminosity of the detector as well as other changing physics requirements. Significant efforts are focused on reducing space requirements and operational costs. The paper discusses our experience with developing a large scale database system, emphasizing universal aspects which may be applied to any large scale system, independently of underlying technology used.

NTIS

Data Bases; Luminosity; Operating Costs

20040008870

Search for Bs Mixing with Inclusive Lepton Events at SLD

Moore, T.; 2003; 20 pp.; In English

Report No.(s): DE2003-813360; SLAC-R-551; No Copyright; Avail: Department of Energy Information Bridge

We have performed a sensitive search for $B(s)(\sup 0) - (\bar{B})(s)(\sup 0)$ mixing using a sample of 400,000 hadronic $Z(\sup 0)$ decays collected by the SLD experiment at the SLC between 1996 and 1998. $B(s)(\sup 0)$ and $(\bar{B})(s)(\sup 0)$ events were produced by $Z(\sup 0) \rightarrow b(\bar{b})$ decays where each side hadronized independently to b hadrons. The analysis determines the b hadron flavor at production by exploiting the large polarized forward-backward asymmetry of the b quark as well as information from the hemisphere opposite that of the reconstructed B decay. The final state b quark flavor is determined by the charge of a high $p(\sub T)$ lepton. A novel, highly efficient vertexing technique has been developed to locate the B decay vertex by exploiting the high $p(\sub T)$ lepton and the semileptonic decay topology.

NTIS

Quarks; Asymmetry; Leptons

20040008874, California Inst. of Tech., Pasadena, CA, Istituto Nazionale di Fisica Nucleare, Rome, Italy, Ohio State Univ., Columbus, OH, USA

Distributed Offline Data Reconstruction in BABAR

Ryd, A.; Crescente, A.; Dorigo, A.; Galeazzi, F.; Morandin, M.; 2003; 12 pp.; In English

Report No.(s): DE2003-813345; SLAC-PUB-9903; No Copyright; Avail: Department of Energy Information Bridge

The BABAR experiment at SLAC is in its fourth year of running. The data processing system has been continuously evolving to meet the challenges of higher luminosity running and the increasing bulk of data to re-process each year. To meet these goals a two-pass processing architecture has been adopted, where rolling calibrations are quickly calculated on a small fraction of the events in the first pass and the bulk data reconstruction done in the second. This allows for quick detector feedback in the first pass and allows for the parallelization of the second pass over two or more separate farms. This two-pass system allows also for dis-site. The first such site has been setup at INFN Padova. The challenges met here were many. The software was ported to a full Linux-based, commodity hardware system. The raw dataset, 90 TB, was imported from SLAC utilizing a 155 Mbps network link. A system for quality control and export of the processed data back to SLAC was developed. Between SLAC and Padova we are currently running three pass-one farms, with 32 CPUs each, and nine pass-two farms with 64 to 80 CPUs each. The pass-two farms can process between 2 and 4 million events per day. Details about the implementation and performance of the system will be presented.

NTIS

Data Processing Equipment; Radiation Detectors

20040008877

BABAR: A Community Web Site in an Organizational Setting

Cowan, R.; Deshpande, Y.; White, B.; Jul. 2003; 12 pp.; In English

Report No.(s): DE2003-813351; SLAC-PUB-9975; No Copyright; Avail: Department of Energy Information Bridge

The BABAR Web site was established in 1993 at the Stanford Linear Accelerator Center (SLAC) to support the BABAR experiment, to report its results, and to facilitate communication among its scientific and engineering collaborators, currently numbering about 600 individuals from 75 collaborating institutions in 10 countries. The BABAR Web site is, therefore, a community Web site. At the same time it is hosted at SLAC and funded by agencies that demand adherence to policies decided under different priorities. Additionally, the BABAR Web administrators deal with the problems that arise during the course of managing users, content, policies, standards, and changing technologies. Desired solutions to some of these problems may be incompatible with the overall administration of the SLAC Web sites and/or the SLAC policies and concerns. There are thus different perspectives of the same Web site and differing expectations in segments of the SLAC population which act as constraints and challenges in any review or re-engineering activities. Web Engineering, which post-dates the BABAR Web, has aimed to provide a comprehensive understanding of all aspects of Web development. This paper reports on the first part of a recent review of application of Web Engineering methods to the BABAR Web site, which has led to explicit user and information models of the BABAR community and how SLAC and the BABAR community relate and react to each other. The paper identifies the issues of a community Web site in a hierarchical, semi-governmental sector and formulates a strategy for periodic reviews of BABAR and similar sites.

NTIS

Linear Accelerators; Websites

20040010335 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Noncommutative Geometry in M-Theory and Conformal Field Theory

Morariu, B.; May 1999; 176 pp.; In English

Report No.(s): DE2003-760324; LBNL-43407; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Geometry; Quantum Theory

20040010336

Theoretical Problems in Accelerator Physics, Progress Report

2003; 26 pp.; In English

Report No.(s): DE2003-762441; No Copyright; Avail: Department of Energy Information Bridge

This is the first progress report submitted since my current grant was renewed and covers progress made since the submission of the renewal proposal November 12, 1998. During this period I have continued to spend approximately one half of my time at SLAC and many of the projects reported here were carried out in collaboration with individuals and groups at SLAC. Except where otherwise noted, reference numbers in the text refer to the attached list of grant publications. Copies of not previously reported publications (asterisked in the list), numbered in agreement with the publication list, are included with this report.

NTIS

Proposals; Theoretical Physics; Particle Accelerators

20040010346

de Sitter Vacua in String Theory

Kachru, S.; Kallosh, R.; Linde, A.; Trivedi, S. P.; Feb. 2003; 16 pp.; In English

Report No.(s): DE2003-812628; SLAC-PUB-9630; No Copyright; Avail: Department of Energy Information Bridge

We outline the construction of metastable de Sitter vacua of type IIB string theory. Our starting point is highly warped IIB compactifications with nontrivial NS and RR three-form fluxes. By incorporating known corrections to the superpotential from Euclidean D-brane instantons or gaugino condensation, one can make models with all moduli fixed, yielding a supersymmetric AdS vacuum. Inclusion of a small number of D3 branes in the resulting warped geometry allows one to uplift the AdS minimum and make it a metastable de Sitter ground state. The lifetime of our metastable de Sitter vacua is much greater than the cosmological timescale of 10^{10} years. We also prove, under certain conditions, that the lifetime of dS space in string theory will always be shorter than the recurrence time.

NTIS

String Theory; Supersymmetry; Euclidean Geometry

20040010347 Mississippi Univ., University, MS, USA

Search for Rare Charm Meson Decays at FNAL E791

Summers, D. J.; 2003; 20 pp.; In English

Report No.(s): DE2003-812843; FERMILAB-CONF-01/236-E; No Copyright; Avail: Department of Energy Information Bridge

We report the results of a blind search for flavor-changing neutral current (FCNC), lepton-flavor violating, and lepton-number violating decays of $D(\text{sup+})$, $D(\text{sub s})(\text{sup+})$, and $D(\text{sup } 0)$ mesons (and their antiparticles) into 2-, 3-, and 4-body states including a lepton pair. Such decays may involve Flavor-Changing Neutral Currents, Leptoquarks, Horizontal Gauge Bosons, or Majorana Neutrinos. No evidence for any of these decays is found. Therefore, we present 90% confidence level branching-fraction upper limits, typically at the $10(\text{sup } -4)$ level. A total of 51 decay channels have been examined; 26 have not been previously reported and 18 are significant improvements over previous results.

NTIS

Antiparticles; Bosons; Measuring Instruments; Particle Decay; Mesons

20040010383 Stanford Linear Accelerator Center, Stanford, CA, USA

Model Independent Analysis of Beam Dynamics in Accelerators

Wang, C.; Irwin, J.; Bane, K.; Cai, Y.; Minty, M.; Apr. 2003; 14 pp.; In English

Report No.(s): DE2003-812982; SLAC-PUB-7909; No Copyright; Avail: Department of Energy Information Bridge

In this paper, we address fundamental issues in BPM-based observations and present methods to analyze beam dynamics in an accelerator. The analysis methods do not rely on any particular machine model, and therefore are referred to as Model Independent Analysis (MIA). There are two major parts in MIA. One is noise reduction and degree-of-freedom analysis using a singular value decomposition of BPM-reading matrix. The other is a physical base decomposition of the BPM-reading matrix based on the time structure of pulse-by-pulse beam and/or machine parameters. The combination of these two methods allow one to break the resolution limit set by individual BPMs and observe beam dynamics at more accurate levels.

NTIS

Particle Accelerators; Models; Power Beaming

20040010402 Northwestern Univ., Evanston, IL

Failure Prediction of Underwater Structures - Subdomain Decomposition and Meshfree Methods

Belytschko, Ted; Nov. 15, 2003; 21 pp.; In English

Contract(s)/Grant(s): N00014-93-1-0292

Report No.(s): AD-A419062; 0650-350-N484; No Copyright; Avail: CASI; [A03](#), Hardcopy

Meshfree methods for fracture have been extended by considering more general classes of basis functions. These methods do not require any elements, and boundaries and interfaces, such as cracks, are easy to propagate in the model since it does not involve remeshing. The versatility of these methods has been enhanced by developing new vector level set methods. The method has been applied to a variety of crack growth problems in two dimensions including problems involving welds and fillets. Comparisons with experiments show excellent agreement. Domain decomposition methods, whereby a fine scale model can be linked with a coarse scale model were developed. These methods are useful when a part of a ship where severe damage is expected must be modeled by a refined mesh for accuracy and linked to a coarser mesh of the remainder of the ship.

DTIC

Computational Grids; Failure Analysis; Grid Generation (Mathematics)

20040010411, Hanyang Univ., Seoul, Korea, Republic of

Chiral Rings, Mirror Symmetry and the Fate of Localized Tachyons

Sin, S. J.; Mar. 2003; 58 pp.; In English

Report No.(s): DE2003-812956; SLAC-PUB-9665; No Copyright; Avail: Department of Energy Information Bridge

We study the localized tachyon condensation of non-supersymmetric orbifold backgrounds in their mirror Landau-Ginzburg picture. We first show that the R-charges of chiral primaries increase under the process of condensing the tachyon in the same chiral ring. Then, utilizing the existence of four copies of worldsheet supersymmetry, we show that the minimal tachyon mass in twisted sectors increases in CFT and type 0 string and it plays the role of the c-function of the twisted sectors. We also study the GSO projection in detail and show that type II decays to only to type II while type 0 can mix with type 0 and II under the RG-flow.

NTIS

Tachyons; Symmetry; Condensing; Mirrors; Supersymmetry

20040010412

Measurement of the total Cross Section for (positon)(Electron) at square root of $\sqrt{s}=10.52$ GeV

2003; 24 pp.; In English

Report No.(s): DE2003-813067; SLAC-PUB-9765; No Copyright; Avail: Department of Energy Information Bridge

The measurement of the hadronic production cross section in $e^{+}e^{-}$ annihilation is perhaps the most fundamental experimentally accessible quantity in quantum chromodynamics (QCD) due to its insensitivity to the fragmentation process. The measured hadronic cross-section is generally expressed in terms of its ratio R to the point cross-section for micro + micro production. In QCD, R is directly proportional to the number of colors, depends on quark charges, and varies with energy, both discretely as quark mass thresholds are crossed, and gradually as the strong coupling constant α_s 'runs'. So, historically, R measurements have been valuable in verifying quark thresholds, charges, color-counting, and the existence of the gluon.

NTIS

Positrons; Electron Emission; Cross Sections

20040010420, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Advanced Accelerator Technologies: A Snowmass '96 Subgroup Summary

Chattopadhyay, S.; Whittum, D.; Wurtele, J.; 2003; 20 pp.; In English

Report No.(s): DE2003-813200; SLAC-PUB-9914; No Copyright; Avail: Department of Energy Information Bridge

We address the collider physics issues, concepts and technologies of $(e^{+}e^{-} \text{ gamma})$ colliders at a cm. energy of 5 TeV and a luminosity of $10(35)/\text{sq cm s}$. The Advanced Accelerator Technologies subgroup at Snowmass'96 provided the platform to discuss and evaluate concepts as well as technologies for achieving $(e^{+}e^{-} \text{ gamma})$ collisions at a center-of-mass energy of 5 TeV with a luminosity of $10(35)/\text{sq cm s}$. The collider parameters were grounded to the key issues of achievable acceleration gradient, beam emittance, beam stability and overall power efficiency: they had direct implications on the length (compactness), beam quality (luminosity), average luminosity (physics reach) and wall-plug power (operating cost) of the collider. One of the primary goals of the group was also to identify promising research and development directions in potential electromagnetic power sources, acceleration schemes, accelerating structures and instrumentation relevant to such high energy, high luminosity colliders.

NTIS

Technology Transfer; Nuclear Physics; Particle Accelerators

20040010421 Fermi National Accelerator Lab., Batavia, IL, USA, Argonne National Lab., IL, Kansas State Univ., Manhattan, KS, USA, Columbia Univ., New York, NY, USA

Structure Function Subgroup Summary

Albrow, M.; Berger, E. L.; Bolton, T.; Caldwell, A.; El-Khadra, A.; 2003; 18 pp.; In English

Report No.(s): DE2003-813201; SLAC-PUB-9915; No Copyright; Avail: Department of Energy Information Bridge

We summarize the studies and discussions of the Structure Function subgroup of the QCD working group of the Snowmass 1996 Workshop: New Directions for High Energy Physics. Our knowledge of the structure functions of hadrons, and the parton density functions (PDFs) derived from them, has improved over time, due both to the steadily increasing quantity and precision of a wide variety of measurements, and a more sophisticated theoretical understanding of QCD. Structure functions, and PDFs, play a dual role: they are a necessary input to predictions for high momentum transfer processes involving hadrons, and they contain important information themselves about the underlying physics of hadrons. Their study is an essential element for future progress in the understanding of fundamental particles and interactions.

NTIS

Hadrons; High Energy Interactions; Partons; Quantum Chromodynamics

20040010422, California Univ., Santa Cruz, CA, USA, California Univ., Davis, CA, USA, Chicago Univ., Chicago, IL, USA

Weakly-Coupled Higgs Bosons and Precision Electroweak Physics

Haber, H. E.; Han, T.; Merritt, F. S.; Womersley, J.; 2003; 22 pp.; In English

Report No.(s): DE2003-813202; SLAC-PUB-9916; No Copyright; Avail: Department of Energy Information Bridge

We examine the prospects for discovering and elucidating the weakly-coupled Higgs sector at future collider experiments. The Higgs search consists of three phases: (1) discovery of a Higgs candidate, (2) verification of the Higgs interpretation of the signal, and (3) precision measurements of Higgs sector properties. The discovery of one Higgs boson with Standard Model properties is not sufficient to expose the underlying structure of the electroweak symmetry breaking dynamics. It is critical to

search for evidence for a non-minimal Higgs sector and/or new physics associated with electroweak symmetry breaking dynamics. An improvement in precision electroweak data at future colliders can play a useful role in confirming the theoretical interpretation of the Higgs search results.

NTIS

Higgs Bosons; Symmetry; Bosons

20040010423

Measurement of the Tau Lepton Lifetime

2003; 16 pp.; In English

Report No.(s): DE2003-813204; SLAC-PUB-9918; No Copyright; Avail: Department of Energy Information Bridge

The decay of the tau lepton provides a useful testing ground for the Standard Model of electroweak interactions. Within the framework of this model the tau is a sequential lepton, and therefore its properties such as mass, lifetime, and leptonic decay rate are related to each other. In this paper we present a new measurement of the tau lifetime based on a high statistics sample of tau pairs produced in e^+e^- annihilations. We reconstruct vertices from decays with three charged tracks to measure the decay point in events with the other tau decaying into either one (1 vs 3) or three charged tracks (3 vs 3). With the 3 vs 3 sample we use both decay vertices without reference to the production point, which is uncertain because of the beam size. This is the first high statistics measurement by this technique, which will be extendible to future experiments having precision vertex detection and high event rates.

NTIS

Annihilation Reactions; Decay Rates; Electroweak Interactions (Field Theory); Leptons; Particle Decay

20040010424, Maryland Univ., College Park, MD, USA

High Power Liquid Hydrogen Target for Parity Violation Experiments

Beise, E. J.; Beck, D. H.; Candell, E.; Carr, R.; Duncan, F.; 2003; 26 pp.; In English

Report No.(s): DE2003-813215; SLAC-PUB-9934; No Copyright; Avail: Department of Energy Information Bridge

In this paper a summary of its design and operation is presented, as well as results to date of studies of its performance with and without incident beam. Section II describes the target system including the target loop and cell, the refrigeration system, gas handling and computer controls. It is followed in Section III by a discussion of operating experience without beam and a set of studies designed to understand the efficiency of the circulating pump and heat exchanger. The paper concludes with a discussion of operational experience with beam on target and the resulting implications for the experimental determination of the parity-violating asymmetry to be measured in the SAMPLE experiment.

NTIS

Deuterium; Liquid Hydrogen; Parity; Circulation; Asymmetry

20040010425

Symplecticity in Beam Dynamics: An Introduction

Rees, J. R.; Jun. 10, 2003; 60 pp.; In English

Report No.(s): DE2003-813219; SLAC-PUB-9939; No Copyright; Avail: Department of Energy Information Bridge

A particle in a particle accelerator can often be considered a Hamiltonian system, and when that is the case, its motion obeys the constraints of the Symplectic Condition. This tutorial monograph derives the condition from the requirement that a canonical transformation must yield a new Hamiltonian system from an old one. It then explains some of the consequences of symplecticity and discusses examples of its applications, touching on symplectic matrices, phase space and Liouville's Theorem, Lagrange and Poisson brackets, Lie algebra, Lie operators and Lie transformations, symplectic maps and symplectic integrators.

NTIS

Particle Accelerators; Hamiltonian Functions; Power Beaming

20040010426

Duality and Other Exotic Gauge Dynamics in Softly Broken Supersymmetric QCD

Ahrony, O.; Sonnenschein, J.; Jul. 2003; 18 pp.; In English

Report No.(s): DE2003-813236; SLAC-PUB-9959; HEP-TH/9509165; No Copyright; Avail: Department of Energy Information Bridge

We analyze the theory of softly broken supersymmetric QCD. Exotic behavior like spontaneously broken baryon number,

massless composite fermions and Seibergs duality seems to persist also in the presence of (small) soft supersymmetry breaking. We argue that certain, specially tailored, lattice simulations may be able to detect the novel phenomena. Most of the exotic behavior does not survive the decoupling limit of large SUSY breaking parameters.

NTIS

Quantum Chromodynamics; Broken Symmetry; Baryons

20040010429

High Anisotropy CoPtCrB Magnetic Recording Media

Toney, M. F.; Jun. 2003; 26 pp.; In English

Report No.(s): DE2003-813356; SLAC-PUB-9991; No Copyright; Avail: Department of Energy Information Bridge

The development of thermally stable, thin, small grain recording media is pivotal for magnetic recording beyond 200 Gbits. This requires media with high magnetic anisotropy and coercivity. There are several alternative materials under investigation that provide adequately high anisotropy, including chemically ordered alloys such as FePt and CoPt and rare-earth transition-metal alloys. Another route to achieve this goal is to increase the magnetocrystalline anisotropy of current state-of-the-art CoPtCrB alloys. The anisotropy is enhanced by Pt substitution of the Co atoms in the hexagonal-close packed (hcp) structure. This approach has the advantage that it is a relatively small change in the disk manufacturing process.

NTIS

Anisotropy; Magnetic Films

20040010431 International Business Machines Corp., Yorktown Heights, USA

X-Ray Studies of Magnetic Nanoparticle Assemblies

Anders, S.; Toney, M. F.; Thomson, T.; Thiele, J. U.; Terris, B. D.; 2003; 16 pp.; In English

Report No.(s): DE2003-813358; SLAC-PUB-9994; No Copyright; Avail: Department of Energy Information Bridge

Monodisperse FePt nanoparticles were prepared using high temperature solution phase synthesis. Polymer-mediated layer-by-layer growth leads to precise control of the particle self-assembly. The narrow particle size distribution offers the potential for increased data storage density by utilizing a smaller mean particle size and ultimately storage of one bit per individual nanoparticle. We have studied self-assembled multilayers of magnetic FePt nanoparticles. The L10 phase of FePt has a very high magnetic anisotropy which allows the magnetization of particles of about 4 nm diameter to be thermally stable at room temperature. Magnetic measurements using vibrating sample magnetometer were combined with X-ray diffraction (XRD) and Near Edge X-ray Absorption Fine Structure (NEXAFS) Spectroscopy to study the annealed FePt nanoparticle assemblies and to optimize annealing conditions.

NTIS

X Ray Diffraction; Magnetic Properties; Nanostructure (Characteristics)

20040010445 Helsinki Univ. of Technology, Espoo, Finland

Electromagnetics Laboratory Annual Report 2002

Sihvola, A.; Feb. 2003; 32 pp.

Report No.(s): PB2004-101242; REPT-405; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Introductory Data; Personnel of the Electromagnetics Laboratory; Visitors; Teaching; Degrees and Theses; Professional Activities; Recognition Conferences and Visits; Laboratory Reports; and Publications.

NTIS

Electromagnetic Radiation; Laboratories; Research

20040010447 Helsinki Univ. of Technology, Espoo, Finland

Electrostatic Image Theory for the Anisotropic Boundary

Lindell, I. V.; Haenninen, J. J.; Nikoskinen, K. I.; Dec. 2002; 28 pp.

Report No.(s): PB2004-101244; REPT-404; Copyright; Avail: National Technical Information Service (NTIS)

A novel image theory for electrostatic problems involving the anisotropic impedance boundary is introduced through Heaviside operator calculus. The image of a point charge in front of an anisotropic boundary plane is given in terms of a combination of point charge and surface charge distributions. The latter consists of a planar angular sector of exponentially decaying surface charge bounded by two line charges. The angle of the sector depends on the anisotropy of the boundary. For vanishing anisotropy the sector contracts to an exponentially decaying line charge coinciding with the result derived previously for the isotropic boundary. The theory is validated numerically by computing potential values from the image and

through inverse Fourier transform techniques. With an obvious change of symbols the theory is applicable to magnetostatic problems or problems involving DC currents in conducting media.

NTIS

Magnetostatics; Electrostatics; Mathematical Models

20040010448 Helsinki Univ. of Technology, Espoo, Finland

Electrostatic Image Theory for Two Intersecting Conducting Spheres

Lindell, I. V.; Wallen, K. H.; Sihvola, A. H.; Feb. 2003; 24 pp.

Report No.(s): PB2004-101245; REPT-406; Copyright; Avail: National Technical Information Service (NTIS)

The classical electrostatic image principle for a perfectly conducting object consisting of two orthogonally intersecting spheres is revisited through vector analysis. A method for finding the image of a given charge distribution by splitting it in three virtual single-sphere problems is described. Also, a simple relation between the images charges of a given point charge is found. The method is applied to finding exact expressions for the polarizability dyadic of the object to be used as a benchmark for testing computing schemes on a nontrivial geometry. Application of the present object as a model for an oblong particle in a composite dielectric is also discussed.

NTIS

Electrostatics; Algorithms

20040010449 Swedish Defence Research Establishment, Linköping

Optimization of a Spatial Light Modulator for Beam Steering and Tracking Applications

Stigwall, J.; Dec. 2002; 64 pp.

Report No.(s): PB2004-101269; FOI-R-0552-SE; Copyright; Avail: National Technical Information Service (NTIS)

Spatial light modulators (SLMs) based on liquid crystal technology are devices where the refractive index and the phase of the light can be controlled in every pixel over a surface by an electric field. By applying a sawtooth refractive index pattern corresponding to a linear phase shift the direction of a reflected laser beam can be changed. The steering direction can be set exactly, but due to diffraction effects light will also scatter into unwanted directions. This study contains an optical characterization of a liquid crystal SLM and the development of an appropriate simulation model that describes its performance. Using the results from the characterization and the simulations four methods that compensate for the unwanted diffraction effects were developed, as well as two methods that increase the switching speed. Employing compensation methods the useable steering range of the examined device was extended to about + or - 2 deg and the switching speed was roughly doubled. In addition, some tracking algorithms were developed and evaluated in a laboratory set-up.

NTIS

Beam Steering; Light Modulators

20040010472 Rutherford Appleton Lab., Chilton, UK

OSIRIS User Guide, 1st Edition

Telling, M. T. F.; Andersen, K. H.; May 2003; 46 pp.; In English

Report No.(s): PB2004-102388; No Copyright; Avail: CASI; A03, Hardcopy

This user guide contains all the information necessary to perform a successful neutron scattering experiment on the OSIRIS spectrometer at the ISIS Facility, RAL, UK. However, to ensure it is as concise as possible, other manuals and reports are referenced for specific details. This first section highlights the basic underlying physics of OSIRIS operating as a high-resolution quasi / in-elastic spectrometer and high-resolution long-wavelength diffractometer. Section 2, 'Performing an experiment on OSIRIS', details a typical experimental procedure. Finally, sections 3 and 4 discuss computer control as well as data analysis and visualisation.

NTIS

Neutron Diffraction; Neutron Sources; Artificial Satellites

20040010485

Calculation of the Coherent Synchrotron Radiation Impedance from a Wiggler

Wu, J.; Raubenheimer, T.; Stupakov, G.; Jan. 2003; 14 pp.; In English

Report No.(s): DE2003-812614; SLAC-PUB-9628; No Copyright; Avail: Department of Energy Information Bridge

Most studies of Coherent Synchrotron Radiation (CSR) have only considered the radiation from independent dipole magnets. However, in the damping rings of future linear colliders, a large fraction of the radiation power will be emitted in

damping wigglers. In this paper, the longitudinal wakefield and impedance due to CSR in a wiggler are derived in the limit of a large wiggler parameter K . After an appropriate scaling, the results can be expressed in terms of universal functions, which are independent of K . Analytical asymptotic results are obtained for the wakefield in the limit of large and small distances, and for the impedance in the limit of small and high frequencies.

NTIS

Synchrotron Radiation; Coherent Radiation; Impedance; Wiggler Magnets

20040010486, European Organization for Nuclear Research, Geneva, Switzerland, Liverpool Univ., UK, Tel-Aviv Univ., Ramat-Aviv, Tel-Aviv, Israel

Asymptotic Padé Approximant Predictions: up to Five Loops in QCD and SQCD

Ellis, J.; Jack, I.; Jones, D. R. T.; Karliner, M.; Samuel, M. A.; Oct. 1997; 32 pp.; In English

Report No.(s): DE2003-813121; SLAC-PUB-9933; No Copyright; Avail: Department of Energy Information Bridge

One of the greatest challenges in quantum chromodynamics (QCD) is the calculation of higher orders in perturbation theory. Phenomenologically, these are important because the relatively large s at accessible energies implies that many orders of perturbation theory are required in order to make precise quantitative tests. Theoretically, one expects the coefficients of the perturbative series for many QCD quantities to diverge factorially, and the rates of these divergences may cast light on issues in nonperturbative QCD, such as the existence and magnitudes of condensates and higher-twist effects.

NTIS

Quantum Chromodynamics; Perturbation Theory; Loops

20040010487

Measurements of the Meson-Photon Transition Form Factors of Light Pseudoscalar Mesons at Large Momentum Transfer

2003; 34 pp.; In English

Report No.(s): DE2003-813123; SLAC-PUB-9838; No Copyright; Avail: Department of Energy Information Bridge

Using the CLEO II detector, we have measured the differential cross sections for exclusive two-photon production of light pseudoscalar mesons (π^0), (η), and (η'). From our measurements we have obtained the form factors associated with the electromagnetic transitions $(\gamma^*)^* \rightarrow \text{meson}$. We have measured these form factors in the momentum transfer ranges from 1.5 to 9, 20, and 30 GeV^2 for π^0 , η , and η' , respectively, and have made comparisons to various theoretical predictions.

NTIS

Mesons; Momentum Transfer; Scattering Cross Sections

20040010488

Braneless Black Holes

Halyo, E.; Rajaraman, A.; Susskind, L.; Jan. 09, 2003; 12 pp.; In English

Report No.(s): DE2003-813205; SLAC-PUB-9919; No Copyright; Avail: Department of Energy Information Bridge

It is known that the naive version of D-brane theory is inadequate to explain the black hole entropy in the limit in which the Schwarzschild radius becomes larger than all compactification radii. We present evidence that a more consistent description can be given in terms of strings with rescaled tensions. We show that the rescaling can be interpreted as a redshift of the tension of a fundamental string in the gravitational field of the black hole. An interesting connection is found between the string level number and the Rindler energy. Using this connection, we reproduce the entropies of Schwarzschild black holes in arbitrary dimensions in terms of the entropy of a single string at the Hagedorn temperature.

NTIS

Black Holes (Astronomy); Gravitational Fields

20040010489, Brookhaven National Lab., Upton, NY, Fermi National Accelerator Lab., Batavia, IL, USA

Muon Collier Design

Palmer, R.; Sessler, A.; Skrinksky, A.; Tallestrup, A.; Baltz, A.; 2003; 48 pp.; In English

Report No.(s): DE2003-813207; SLAC-PUB-9921; No Copyright; Avail: Department of Energy Information Bridge

Muon Colliders have unique technical and physics advantages and disadvantages when compared with both hadron and electron machines. They should thus be regarded as complementary. Parameters are given of 4 TeV and 0.5 TeV high luminosity ($\mu^+\mu^-$) colliders, and of a 0.5 TeV lower luminosity demonstration machine. We discuss the various

systems in such muon colliders, starting from the proton accelerator needed to generate the muons and proceeding through muon cooling, acceleration and storage in a collider ring. Detector background, polarization, and nonstandard operating conditions are discussed.

NTIS

Muons; Luminosity; Storage Rings (Particle Accelerators)

20040010490, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Calculation and Optimization of Laser Acceleration in Vacuum

Hunag, Z.; Stupakov, G.; Zolorev, M.; Jun. 2003; 22 pp.; In English

Report No.(s): DE2003-813211; SLAC-PUB-9928; No Copyright; Avail: Department of Energy Information Bridge

Extraordinarily high fields generated by focused lasers are envisioned to accelerate particles to high energies. In this paper, we develop a new method to calculate laser acceleration in vacuum based on the energy exchange arose from the interference of the laser field with the radiation field of the particle. We apply this method to a simple accelerating structure, a perfectly conducting screen with a round hole, and show that how to optimize the energy gain with respect to the hole radius, laser angle and spot size, as well as the transverse profile of the laser. Limitation and energy scaling of this acceleration method are also discussed.

NTIS

Hole Geometry (Mechanics); Holes (Mechanics); Lasers

20040010491, Columbia Univ., New York, NY, USA

Soft Gluons in the Finite Momentum Wave Function and the BFKL Pomeron

Mueller, A. H.; 2003; 18 pp.; In English

Report No.(s): DE2003-813300; SLAC-PUB-10047; No Copyright; Avail: Department of Energy Information Bridge

The object in this paper is to construct the small- x infinite momentum wavefunction of a hadron in QCD for those soft gluons reasonably well localized in a small transverse area. to make the problem of transverse spatial localization simple they choose the large- x part of the hadron to be a heavy quark-antiquark state, an "onium" state. The radius of the onium state then naturally furnishes an infrared cutoff, and if this cutoff is sufficiently large perturbation theory applies. The accuracy of the approximation is leading logarithmic. That is, for the component of the wavefunction having n soft gluons, with momentum between $z^{(0)}p$ and p , where p is the onium momentum, they calculate only the $((\alpha_s)^n 1/z^{(0)})^{(sup n)}$ contribution to the square of the infinite momentum onium wavefunction.

NTIS

Momentum; Quantum Chromodynamics; Wave Functions

20040010492

Experimental Measurement of Resonance Islands Induced by the RF Voltage Modulation

Li, D.; Ball, M.; Brabson, B.; Budnick, J.; Caussyn, D. D.; 2003; 16 pp.; In English

Report No.(s): DE2003-813302; SLAC-PUB-10049; FERMILAB-PUB-93-248; No Copyright; Avail: Department of Energy Information Bridge

Synchrotron motion with an external rf voltage modulation was studied experimentally. Beam particles, in the presence of electron cooling, were observed to damp to the basins of resonance islands, which were produced by the parametric resonance of the rf voltage modulation. The measured phase amplitudes of the centers of these resonance islands were found to agree well with theory.

NTIS

Resonance; Modulation; Synchrotrons

20040010494 California Univ., Berkeley, CA

Geometry, Topology and String Theory

Varadarajan, U.; 2003; In English

Report No.(s): DE2003-813395; No Copyright; Avail: National Technical Information Service (NTIS)

A variety of scenarios are considered which shed light upon the uses and limitations of classical geometric and topological notions in string theory. The primary focus is on situations in which D-brane or string problems of a given classical space-time see the geometry quite differently than one might naively expect. In particular, situations in which extra dimensions, non-commutative geometries as well as other non-local structures emerge are explored in detail. Further, a preliminary

exploration of such issues in Lorentzian space-times with non-trivial causal structures with string theory is initiated.
NTIS
String Theory; Geometry

20040010499 Fermi National Accelerator Lab., Batavia, IL, USA

Proposed Interim Improvement to the Tevatron Beam Position Monitors with Narrow Band Crystal Filters

Tan, C. Y.; Aug. 2003; In English

Report No.(s): DE2003-813540; FERMILAB-TM-2215; No Copyright; Avail: National Technical Information Service (NTIS)

Since the start of Run II, we have found that we are unable to reliably and accurately measure the beam position with the present BPM system during high energy physics (HEP). This problem can be traced back to the analogue front-end called the AM/PM module which has trouble handling coalesced beam, but works well with uncoalesced beam. In this paper, we propose a simple fix to the AM/PM module so that we can measure the beam position during HEP. The idea is to use narrow band crystal filters which ring when pinged by coalesced beam so that the AM/PM module is tricked into thinking that it is measuring uncoalesced beam.

NTIS

Particle Accelerators; Beams (Radiation)

20040010502 Princeton Univ., NJ

Numerical Loading of a Maxwellian Probability Distribution Function

Lewandowski, J. L. V.; Mar. 2003; 22 pp.; In English

Report No.(s): DE2003-813603; PPPL-3798; No Copyright; Avail: Department of Energy Information Bridge

A renormalization procedure for the numerical loading of a Maxwellian probability distribution function (PDF) is formulated. The procedure, which involves the solution of three coupled nonlinear equations, yields a numerically loaded PDF with improved properties for higher velocity moments. This method is particularly useful for low-noise particle-in-cell simulations with electron dynamics.

NTIS

Maxwell-Boltzmann Density Function; Probability Theory

20040010510

First Observation of inclusive Beta to the Charmed Strange Baryons $\chi(\text{sup O})(\text{sub C})$ and $\chi(\text{sup +})(\text{sub C})$

2003; 16 pp.; In English

Report No.(s): DE2003-813082; SLAC-PUB-9781; No Copyright; Avail: Department of Energy Information Bridge

Charmed baryon production from the decays of B mesons has been previously reported by ARGUS and CLEO. Here, we report the first observation of the charmed-strange baryons from B decays, which have previously been observed only in direct charm production. There are several theoretical calculations that attempt to drive the two-body contribution to charmed baryon production in B decays.

NTIS

Baryons; Charm (Particle Physics); Mesons

20040010511

Inclusive Decays $B \rightarrow DX$ and $B \rightarrow D^{(*)}X$

2003; 44 pp.; In English

Report No.(s): DE2003-813092; SLAC-PUB-9795; No Copyright; Avail: Department of Energy Information Bridge

Measurements of weak decays of B mesons are essential to testing and understanding the standard model and determining the fundamental flavor-mixing parameters. These measurements also provide a unique opportunity to examine the short distance behavior of weak decays. Due to their large energy release, long distance corrections are expected to be less significant in hadronic B decay than in hadronic decays of charm and strange quarks. However, the formation of hadrons in the final state is still poorly understood and is an obstacle to predicting rates and spectra for hadronic decays.

NTIS

Antiparticles; Branching (Physics); Particle Decay

20040010512

Measurement of the Decay Amplitudes and Branching Fractions of $B \rightarrow J/\psi K^*$ and $B \rightarrow J/\psi K$ Decays

2003; 16 pp.; In English

Report No.(s): DE2003-813093; SLAC-PUB-9796; No Copyright; Avail: Department of Energy Information Bridge

Using data taken with the CLEO II detector, we present the first angular analysis in the color-suppressed modes $B(\text{sup } O) \rightarrow J/\psi K^*(\text{sup } O)$ and $B(\text{sup } +) \rightarrow J/\psi K^*(\text{sup } +)$. This leads to a complete determination of the decay amplitudes of these modes. In addition, we update the branching functions for $B \rightarrow J/\psi K$ and $B \rightarrow J/\psi K^*$.

NTIS

Decay; Color; Branching (Physics)

20040010513 General Atomics Co., San Diego, CA

Coating and Mandrel Effects on Fabrication of Glow Discharge Polymer NIF Scale Indirect Drive Capsules

Nikroo, A.; Pontelandolfo, J. M.; Castillo, E. R.; Apr. 2002; 14 pp.; In English

Report No.(s): DE2003-813609; GA-A23757; No Copyright; Avail: Department of Energy Information Bridge

Targets for the National Ignition Facility (NIF) need to be about 200(micro)m thick and 2 mm in diameter. These dimensions are well beyond those currently fabricated on a routine basis. They have investigated fabrication of near NIF scale targets using the depolymerizable mandrel technique. Poly-alpha-methylstyrene (PAMS) mandrels, about 2 mm in diameter, of varying qualities were coated with as much as 125(micro)m of glow discharge polymer (GDP). The surface finish of the final shells was examined using a variety of techniques. A clear dependence of the modal spectrum of final GDP shell on the quality of the initial PAMS mandrels was observed. Isolated features were found to be the greatest cause for a shell not meeting the NIF standard.

NTIS

Targets; Glow Discharges; Polymers; Styrenes

20040010514 General Atomics Co., San Diego, CA

Recent Progress in Fabrication of High-Strength Glow Discharge Polymer Shells by Optimization of Coating Parameters

Nikroo, A.; Pontelandolfo, J. M.; Castillo, E. R.; Czechowicz, D. G.; Apr. 2002; 14 pp.; In English

Report No.(s): DE2003-813611; GA-A23758; No Copyright; Avail: Department of Energy Information Bridge

In this paper, the authors report the progress they have made in fabrication of high-strength thin-walled glow discharge polymer (GDP) shells for cryogenic experiments at OMEGA. They have investigated a number of different parameters involved in making such shells. Optimization of hydrogen to hydrocarbon precursor flow has been observed to be critical in obtaining strong shells. They can routinely make high-strength shells of OMEGA size (900(micro)m in diameter) with thicknesses in the range of 1.0 to 1.5(micro)m. The permeabilities of these shells to various gases have been found to be as much as three times higher than those of lower strength shells. Run to run variability and other batch statistics are discussed.

NTIS

Glow Discharges; Coatings

20040010516 Texas A&M Univ., College Station, TX, USA

Development of Real-Time Measurement of Effective Dose for High Dose Rate Neutron Fields

Braby, L. A.; Reece, W. D.; Hsu, W. H.; 2003; 10 pp.; In English

Report No.(s): DE2003-813694; No Copyright; Avail: Department of Energy Information Bridge

Studies of the biological effects of neutrons, and other applications of neutron irradiation facilities, require both a source of neutrons and a way of characterizing the radiation exposure. In the case of neutrons and other high LET radiations, the dose (energy deposited per unit mass) is not sufficient to describe the exposure, since most effects of this radiation depend on the 'quality' of the radiation as well as the energy deposited. No ideal way of specifying radiation quality has yet been found, but neutron energy, the linear energy transfer of the secondary radiation, and the lineal energy have been used in formulating different definitions of quality. Depending on the source of the radiation it may be relatively easy to calculate the neutron energy spectrum, or it may be very difficult. It is almost always difficult to measure the neutron spectrum. If the Neutron spectrum can be evaluated, then the LET distribution can be calculated, but it can not be measured directly. The easiest of the three quantities to measure is the lineal energy. At low dose rates, where individual energy deposition events (passage of a secondary particle through a small volume) can be measured, the probability density of lineal energy can be measured directly and average values such as the dose mean lineal energy can be calculated. However, most experiments require dose rates that

are two high to measure as individual energy deposition events in detectors of reasonable size.

NTIS

Radiation Dosage; Neutron Sources

20040010520

Frequency Chirped SASE FEL

Krinsky, S.; Huang, Z.; Jan. 2003; 22 pp.; In English

Report No.(s): DE2003-812615; SLAC-PUB-9633; No Copyright; Avail: Department of Energy Information Bridge

We present a statistical analysis of the temporal and spectral properties of SASE radiation from an energy-chirped electron beam passing through a long undulator. It is found that the coherence time is independent of the chirp, while the range of spectral coherence is linearly proportional to it. We consider the use of a monochromator to pick out a small temporal slice of the radiation output. For the filtered radiation pulse, we determine the pulse duration, the number of modes and the energy fluctuation. We apply our analysis to schemes proposed to generate short x-ray pulses at the LCLS(Linac Coherent Light Source).

NTIS

Free Electron Lasers; Linear Accelerators; Monochromators

20040010523

Tau Neutrino Helicity from h plus or minus Energy Correlations

2003; 16 pp.; In English

Report No.(s): DE2003-813096; SLAC-PUB-9799; No Copyright; Avail: Department of Energy Information Bridge

We report a measurement of the magnitude of the tau neutrino helicity from tau-pair events taken with the CLEO detector at the CESR electron-positron storage ring. Events in which each tau undergoes the decay $\tau \rightarrow h \nu$ (yields) $h \nu$ with h a charged pion or kaon, are analyzed for energy correlations between the daughter hadrons.

NTIS

Neutrinos; Correlation; Storage Rings (Particle Accelerators)

20040010526 Oak Ridge National Lab., TN, General Atomics Co., San Diego, CA

Complete Suppression of the $m=2/n=1$ Neoclassical Tearing Mode using Electron Cyclotron Current Drive on DIII-D

Petty, C. C.; La Haye, R. J.; Luce, T. C.; Humphreys, D. A.; Hyatt, A. W.; Mar. 2003; 36 pp.; In English

Report No.(s): DE2003-814001; GA-A24223; No Copyright; Avail: Department of Energy Information Bridge

The first suppression of the important and deleterious $m=2/n=1$ neoclassical tearing mode (NTM) is reported using electron cyclotron current drive (ECCD) to replace the 'missing' bootstrap current in the island O-point. Experiments on the DIII-D tokamak verify the maximum shrinkage of the $m=2/n=1$ island occurs when the ECCD location coincides with the $q=2$ surface. The DIII-D plasma control system is put into search and suppress mode to make small changes in the toroidal field to find and lock onto the optimum position, based on real time measurements of $dB(\text{sub}(\theta))/dt$, for complete $m=2/n=1$ NTM suppression by ECCD. The requirements on the ECCD for complete island suppression are well modeled by the modified Rutherford equation for the DIII-D plasma conditions.

NTIS

Tokamak Devices; Cyclotrons; Retarding

20040010558 Stanford Univ., CA, USA

Brief History of Gyroscopes

Range, Shannon Kdoah; Mullins, Jennifer; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Gravity Probe B has made one of the most sophisticated and accurate gyroscopes in the world to measure the shape and motion of local spacetime. Yet, their gyroscopes have much in common with the simplest toy tops that children have played with for centuries. The spinning top retains its balance through a physical phenomenon called 'precession'. Without this phenomena, there would be no toy tops or Gravity Probe B.

Author

Gyroscopes; Space-Time Functions; Gravity Probe B

20040010616

Stringy Resolutions of Null Singularities

Fabinger, M.; Hellerman, S.; Jan. 2003; 32 pp.; In English

Report No.(s): DE2003-812631; SLAC-PUB-9636; No Copyright; Avail: Department of Energy Information Bridge

We study string theory in supersymmetric time-dependent backgrounds. In the framework of general relativity, supersymmetry for spacetimes without flux implies the existence of a covariantly constant null vector, and a relatively simple form of the metric. As a result, the local nature of any such spacetime can be easily understood. We show that we can view any such geometry as a sequence of solutions to lower-dimensional Euclidean gravity. If we choose the lower-dimensional solutions to degenerate at some light-cone time, we obtain null singularities, which may be thought of as generalizations of the parabolic orbifold singularity. We find that in string theory, many such null singularities get repaired by alpha-corrections - in particular, by worldsheet instantons. As a consequence, the resulting string theory solutions do not suffer from any instability. Even though the CFT description of these solutions is not always valid, they can still be well understood after taking the effects of light D-branes into account; the breakdown of the worldsheet conformal field theory is purely gauge-theoretic, not involving strong gravitational effects.

NTIS

Singularity (Mathematics); String Theory; Euclidean Geometry; Space-Time Functions

20040010617

Analyses of $D + K(\sup O)(\sub S)$ and $D + K(\sup O)(\sub S)\pi$

2003; 14 pp.; In English

Report No.(s): DE2003-813099; SLAC-PUB-9803; No Copyright; Avail: Department of Energy Information Bridge

Using data collected with the CLEO II detector at the Cornell Electron Storage Ring, we present new measurements of the branching fractions for $D + (\text{yields}) K(\sup S)K(+)$ and $D + (\text{yields}) K(\sup S)\pi$. These results are combined with other CLEO measurements to extract the ratios of isospin amplitudes and phase shifts.

NTIS

Radiation Detectors; Storage Rings (Particle Accelerators); Branching (Physics); Extraction

20040010618

Measurement of the Michel Parameters in Leptonic Decays of the Tau

Dec. 26, 1996; 16 pp.; In English

Report No.(s): DE2003-813105; SLAC-PUB-9811; No Copyright; Avail: Department of Energy Information Bridge

Leptonic decays are sensitive probes of the charged weak interaction since the strong interaction plays no role in decays. The Lorentz structure of the currents are well established. In this paper, we investigate the vertex. In the decays of the information on the decay can be extracted from the shape of the momentum distribution of the lepton, and from its angular distribution relative to the parent spin direction.

NTIS

Leptons; Particle Decay

20040010621

LEGO: A Modular Approach to Accelerator Alignment Data Analysis

Le Cocq, C.; Oct. 1997; 12 pp.; In English

Report No.(s): DE2003-813116; SLAC-PUB-9824; No Copyright; Avail: Department of Energy Information Bridge

The underlying unity of the numerous surveying computational methods is hidden by many practical differences in data acquisition. Traditional programming languages have added to the confusion by requiring programmers to describe the numeric data in very concrete and low-level structures (mostly arrays). In fact the algorithms behind all coordinate determination from surveying observations come down to basic methods of linear algebra. Lego uses the paradigm of object oriented programming (OOP) to more closely model the fundamental mathematical structures of all geodetic methods. Once the methods are in OOP form, the commonality across them becomes more obvious and a general architecture for a wide range of geodetic treatments becomes possible. This paper describes the fundamental concepts of this architecture and its advantages in terms of clarity, portability and extensibility.

NTIS

Linear Accelerators; Alignment

20040010630 Stanford Linear Accelerator Center, Stanford, CA, USA

Search for $B \rightarrow \mu \text{ Anti-Muon-Neutrino } \Gamma$ and $B \rightarrow e \text{ Anti-Electron-Neutrino } \Gamma$

2003; 16 pp.; In English

Report No.(s): DE2003-813337; SLAC-PUB-9820; No Copyright; Avail: Department of Energy Information Bridge

We have searched for the decays $B \rightarrow \mu (\bar{\nu}_\mu) \gamma$ and $B \rightarrow e (\bar{\nu}_e) \gamma$ in a sample of 2.7 million charged B decays collected with the CLEO II detector. In the muon channel, we observe no candidates in the signal region and set an upper limit on the branching fraction of $B \rightarrow \mu (\bar{\nu}_\mu) \gamma$ less than 5.2×10^{-5} at the 90% confidence level. In the electron channel, we observe 5 candidates in the signal region and set an upper limit on the branching fraction of $B \rightarrow e (\bar{\nu}_e) \gamma$ less than 2.0×10^{-4} at the 90% confidence level.

NTIS

Mesons; Particle Decay; Branching (Physics)

20040010631

Investigation of Semileptonic B Meson Decay to P-Wave Charm Mesons

2003; 14 pp.; In English

Report No.(s): DE2003-813340; SLAC-PUB-9836; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Charm (Particle Physics); Mesons; Particle Decay

20040010632 Stanford Linear Accelerator Center, Stanford, CA, USA

Search for Color-Suppressed B Hadronic Decay Processes with CLEO

2003; 18 pp.; In English

Report No.(s): DE2003-813341; SLAC-PUB-9837; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Hadrons; Mesons; Particle Decay

20040010681 Dynamics Research Corp., Arlington, VA, USA, General Atomics Co., San Diego, CA

Interaction of Neutral Beam Injected Fast Ions with Ion Cyclotron Resonance Frequency Waves

Choi, M.; Chan, V. S.; Chiu, S. C.; Omelchenko, Y. A.; May 2003; 16 pp.; In English

Report No.(s): DE2003-814029; GA-A24318; No Copyright; Avail: Department of Energy Information Bridge

Existing tokamaks such as DIII-D and future experiments like ITER employ both NB injection (NBI) and ion-cyclotron resonance heating (ICRH) for auxiliary heating and current drive. The presence of energetic particles produced by NBI can result in absorption of the Ion cyclotron radio frequency (ICRF) power. ICRF can also interact with the energetic beam ions to alter the characteristics of NBI momentum deposition and resultant impact on current drive and plasma rotation. To study the synergism between NBI and ICRF, a simple physical model for the slowing-down of NB injected fast ions is implemented in a Monte-Carlo rf orbit code. This paper presents the first results. The velocity space distributions of energetic ions generated by ICRF and NBI are calculated and compared. The change in mechanical momentum of the beam and an estimate of its impact on the NB-driven current are presented and compared with ONETWO simulation results.

NTIS

Beam Injection; Cyclotron Resonance; Ion Cyclotron Radiation; Frequencies

20040010717 California Univ., San Diego, CA, USA, Wisconsin Univ., Madison, WI, USA, General Atomics Co., San Diego, CA

Transport by Intermittency in the Boundary of the DIII-D Tokamak

Boedo, J. A.; Rudakov, D. L.; Moyer, R. A.; McKee, G. R.; Colchin, R. J.; Nov. 2002; 34 pp.; In English

Report No.(s): DE2003-813999; GA-A24210; No Copyright; Avail: Department of Energy Information Bridge

Recent evidence indicates that the far scrape-off layer (SOL) density and temperature profiles in various tokamaks and other devices are often non-exponential and flat, enhancing the plasma-wall contact beyond what would be expected from exponential profiles and suggesting that perpendicular transport in these conditions is much larger than expected. Although the preponderance of intermittency and the concomitant fast convective transport in confined plasmas has been established, no

detailed work on the dynamical characteristics and origin nor on the scaling with plasma parameters has been done until the present work.

NTIS

Tokamak Devices; Plasma Diffusion; Transport Properties

20040010744 San Diego Mesa Coll., San Diego, CA, USA, General Atomics Co., San Diego, CA

Large Aspect Ratio Limit of Neoclassical Transport Theory

Wong, S. K.; Chan, V. S.; Nov. 2002; 52 pp.; In English

Report No.(s): DE2003-814027; GA-A24103; No Copyright; Avail: Department of Energy Information Bridge

This article presents a comprehensive description of neoclassical transport theory in the banana regime for large aspect ratio flux surfaces of arbitrary shapes. The method of matched asymptotic expansions is used to obtain analytical solutions for plasma distribution functions and to compute transport coefficients. The method provides justification for retaining only the part of the Fokker-Planck operator that involves the second derivative with respect to the cosine of the pitch angle for the trapped and barely circulating particles. It leads to a simple equation for the freely circulating particles with boundary conditions that embody a discontinuity separating particles moving in opposite directions. Corrections to the transport coefficients are obtained by generalizing an existing boundary layer analysis. The system of moment and field equations is consistently taken in the cylinder limit, which facilitates discussion of the treatment of dynamical constraints. It is shown that the nonlocal nature of Ohm's law in neoclassical theory renders the mathematical problem of plasma transport with changing flux surfaces nonstandard.

NTIS

Transport Theory; Trapped Particles; Plasmas (Physics); Plasma Density; Distribution Functions

20040012605 NASA Marshall Space Flight Center, Huntsville, AL, USA

Magnetic Control of Solutal Buoyancy-driven Convection, Part II, Stability

Leslie, F. W.; Ramachandran, N.; January 2004; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

A theory is presented on the stability of solutal convection of a magnetized fluid in the presence of a magnetic field. The requirements for stability are developed and compared to experiments with a paramagnetic fluid. The theoretical predictions are in good agreement with the experiments and, analogous to results for levitation, the theory indicates that solutal convection in paramagnetic fluids cannot be completely stabilized. Computations for a model diamagnetic fluid are given and show that complete stability is possible if the equilibrium requirements are met in a particular region of the field.

Author

Magnetic Fields; Paramagnetism

20040012849 Oak Ridge National Lab., TN

Initial Experiences with Retrieving Similar Objects in Simulation Data

Cheung, S. C. S.; Kamath, C.; Feb. 21, 2003; 14 pp.; In English

Report No.(s): DE2003-15004401; UCRL-JC-151931; No Copyright; Avail: Department of Energy Information Bridge

Comparing the output of a physics simulation with an experiment, referred to as 'code validation,' is often done by visually comparing the two outputs. In order to determine which simulation is a closer match to the experiment, more quantitative measures are needed. In this paper, we describe our early experiences with this problem by considering the slightly simpler problem of finding objects in a image that are similar to a given query object. Focusing on a dataset from a fluid mixing problem, we report on our experiments with different features that are used to represent the objects of interest in the data. These early results indicate that the features must be chosen carefully to correctly represent the query object and the goal of the similarity search.

NTIS

Computerized Simulation; Physics

20040012868 Stanford Linear Accelerator Center, Stanford, CA, USA

Optical Properties of the DIRC Fused Silica Cherenkov Radiator

Cohen-Tanugi, J.; Convery, M.; Ratcliff, B.; Sarazin, X.; Schwiening, J.; Apr. 2003; 40 pp.; In English

Report No.(s): DE2003-813040; SLAC-PUB-9735; No Copyright; Avail: Department of Energy Information Bridge

The DIRC is a new type of Cherenkov detector that is successfully operating as the hadronic particle identification system for the BABAR experiment at SLAC. The fused silica bars that serve as the DIRCs Cherenkov radiators must transmit the

light over long optical pathlengths with a large number of internal reflections. This imposes a number of stringent and novel requirements on the bar properties. This note summarizes a large amount of R&D that was performed both to develop specifications and production methods and to determine whether commercially produced bars could meet the requirements. One of the major outcomes of this R&D work is an understanding of methods to select radiation hard and optically uniform fused silica material. Others include measurement of the wavelength dependency of the internal reflection coefficient, and its sensitivity to surface contaminants, development of radiator support methods, and selection of good optical glue.

NTIS

Contaminants; Optical Properties; Silica Glass; Detectors

20040012869 Stanford Linear Accelerator Center, Stanford, CA, USA

Single-Mode Coherent Synchrotron Radiation Instability

Heifets, S.; Stupakov, G.; 2003; 30 pp.; In English

Report No.(s): DE2003-812613; SLAC-PUB-9627; No Copyright; Avail: Department of Energy Information Bridge

The microwave instability driven by the coherent synchrotron radiation (CSR) has been previously studied neglecting effect of the shielding caused by the finite beam pipe aperture. In practice, the unstable mode can be close to the shielding threshold where the spectrum of the radiation in a toroidal beam pipe is discrete. In this paper, the CSR instability is studied in the case when it is driven by a single synchronous mode. A system of equations for the beam-wave interaction is derived and its similarity to the 1D FEL theory is demonstrated. In the linear regime, the growth rate of the instability is obtained and a transition to the case of continuous spectrum is discussed. The nonlinear evolution of the single-mode instability, both with and without synchrotron damping and quantum diffusion, is also studied.

NTIS

Beam Interactions; Coherent Radiation; Synchrotron Radiation; Stability

20040012875 Stanford Linear Accelerator Center, Stanford, CA, USA

Observation of the Dynamic Beta Effect CESR with CLEO

2003; 14 pp.; In English

Report No.(s): DE2003-813071; SLAC-PUB-9769; No Copyright; Avail: Department of Energy Information Bridge

Using the silicon strip detector of the CLEO experiment operating at the Cornell Electron-positron Storage Ring (CESR), we have observed that the horizontal size of the luminous region decreases in the presence of the beam-beam interaction from what is expected without the beam-beam interaction. The dependence on the bunch current agrees with the prediction of the dynamic beta effect. This is the first direct observation of the effect.

NTIS

Beam Interactions; Storage Rings (Particle Accelerators)

20040012879 Princeton Univ., NJ

Investigations of Low and Moderate Harmonic Fast Wave Physics on CDX-U

Spaleta, J.; Majeski, R.; Phillips, C. K.; Dumont, R. J.; Kaita, R.; Jul. 2003; 12 pp.; In English

Report No.(s): DE2003-814708; PPPL-3840; No Copyright; Avail: Department of Energy Information Bridge

Third harmonic hydrogen cyclotron fast wave heating studies are planned in the near term on CDX-U to investigate the potential for bulk ion heating. In preparation for these studies, the available RF power in CDX-U has been increased to 0.5 MW. The operating frequency of the CDX-U RF transmitter was lowered to operate in the range of 8 - 10 MHz, providing access to the ion harmonic range $2(\Omega)$ (approx) $4(\Omega)$ in hydrogen. A similar regime is accessible for the 30 MHz RF system on NSTX, at 0.6 Tesla in hydrogen. Preliminary computational studies over the plasma regimes of interest for NSTX and CDX-U indicate the possibility of strong localized absorption on bulk ion species.

NTIS

Cyclotron Radiation; Plasmas (Physics); Transmitters

20040012880 Princeton Univ., NJ

Plasma Dielectric Tensor for Non-Maxwellian Distributions in the FLR Limit

Phillips, C. K.; Pletzer, A.; Dumont, R. J.; Smithe, D. N.; Jul. 2003; 12 pp.; In English

Report No.(s): DE2003-814700; PPPL-3835; No Copyright; Avail: Department of Energy Information Bridge

Previous analytical and numerical studies have noted that the presence of fully non-Maxwellian plasma species can significantly alter the dynamics of electromagnetic waves in magnetized plasmas. In this paper, a general form for the hot

plasma dielectric tensor for non-Maxwellian distributions is derived that is valid in the finite Larmor radius approximation. This model provides some insight into understanding the limitations on representing non-Maxwellian plasma species with equivalent Maxwellian components in modeling RF wave propagation and absorption.

NTIS

Plasma Acceleration; Dielectrics; Tensors

20040012898 Stanford Linear Accelerator Center, Stanford, CA, USA

B System as a Window to New Physics

2003; 18 pp.; In English

Report No.(s): DE2003-813048; SLAC-PUB-9744; No Copyright; Avail: Department of Energy Information Bridge

The opportunities to explore physics beyond the Standard Model in the B meson system are described. After denoting some overall features which are generic consequences of the search for new physics, we concentrate on the effects of new interactions in flavor changing neutral current transitions, focusing on supersymmetry and the left-right symmetric model as specific examples of new physics scenarios.

NTIS

Mesons; Supersymmetry; Standard Model (Particle Physics)

20040012902 Princeton Univ., NJ

Finite-Duration Seeding Effects in Powerful Backward Raman Amplifiers

Yampolsky, N. A.; Malkin, V. M.; Fisch, N. J.; Jul. 2003; 14 pp.; In English

Report No.(s): DE2003-814707; PPPL-3839; No Copyright; Avail: Department of Energy Information Bridge

In the process of backward Raman amplification (BRA), the leading layers of the seed laser pulse can shadow the rear layers, thus weakening the effective seeding power and affecting parameters of output pulses in BRA. We study this effect numerically and also analytically by approximating the pumped pulse by the 'pi-pulse' manifold of self-similar solutions. We determine how the pumped pulse projection moves within the pi-pulse manifold, and describe quantitatively the effective seeding power evolution. Our results extend the quantitative theory of BRA to regimes where the effective seeding power varies substantially during the amplification. These results might be of broader interest, since the basic equations, are general equations for resonant 3-wave interactions.

NTIS

Amplifiers; Seeds; Wave Interaction

20040012906 Stanford Linear Accelerator Center, Stanford, CA, USA

Measurements of the Meson-Photon Transition Form Factors of Light Pseudoscalar Mesons at Large Momentum Transfer

Savinov, V.; 2003; 10 pp.; In English

Report No.(s): DE2003-813069; SLAC-PUB-9767; No Copyright; Avail: Department of Energy Information Bridge

Using the CLEO II detector, we have measured the form factors associated with the electromagnetic transitions $(\gamma^* \rightarrow \gamma) \text{ meson}$. We have measured these form factors in the momentum transfer ranges from 1.5 to 9, 20, and 30 GeV (\sqrt{s}) for (π^0) , (η) , and (η') , respectively.

NTIS

Form Factors; Mesons; Momentum Transfer

20040012907 Stanford Linear Accelerator Center, Stanford, CA, USA

Observation of Exclusive Two-body B Decays to Kaons and Pions

2003; 14 pp.; In English

Report No.(s): DE2003-813062; SLAC-PUB-9759; No Copyright; Avail: Department of Energy Information Bridge

We have studied two-body charmless hadronic decays of B mesons into the final states $(\pi^0 \pi^0)$, $K(\pi^0)$, and KK . Using 3.3 million $B(\bar{B})$ pairs collected with the CLEO-II detector, we have made the first observation of the decays $B(\pi^0) \rightarrow K(\pi^0) \pi^0$, $B(\pi^0) \rightarrow K(\pi^0) \pi^0$, and the sum of $B(\pi^0) \rightarrow K(\pi^0) \pi^0$ and $B(\pi^0) \rightarrow K(\pi^0) \pi^0$ decays (an average over charge-conjugate states is always implied). We place upper limits on branching fractions for the remaining decay modes.

NTIS

Hadrons; Particle Decay; Mesons

20040012908

Pellissier H5 Hydrostatic Level

Imfeld, H. L.; Pellissier, P.; Plouffe, D.; Ruland, R.; 2003; 20 pp.; In English

Report No.(s): DE2003-813063; SLAC-PUB-9760; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Hydrostatics; Research Facilities

20040012910 Stanford Linear Accelerator Center, Stanford, CA, USA

Study of the Beta(sup 0) Semileptonic Decay Spectrum at the upsilon(4S) Resonance

2003; 18 pp.; In English

Report No.(s): DE2003-813094; SLAC-PUB-9797; No Copyright; Avail: Department of Energy Information Bridge

We have made a first measurement of the lepton momentum spectrum in a sample of events enriched in neutral B's through a partial reconstruction of B(sup 0)(yields) D(star)(sup -)(ell)(sup +)(nu). This spectrum, measured with 2.38 fb(sup -1) of data collected at the (Upsilon)(4S) resonance by the CLEO II detector, is compared directly to the inclusive lepton spectrum from all (Upsilon)(4S) events in the same data set. These two spectra are consistent with having the same shape above 1.5 GeV/c. From the two spectra and two other CLEO measurements, we obtain the B(sup 0) and B(sup +) semileptonic branching fractions, b(sub 0) and b(sub +), their ratio, and the production ratio f(sub +-)/f(sub 00) of B(sup +) and B(sup 0) pairs at the (Upsilon)(4S). We report b(sub +)/b(sub 0)= 0.950(sub -0.080)(sup +0.117)(+-) 0.091, b(sub 0)= (10.78(+/-) 0.60(+/-) 0.69)%, and b(sub +)= (10.25(+/-) 0.57(+/-) 0.65)%. B(sub +)/b(sub 0) is equivalent to the ratio of charged to neutral B lifetimes,(tau)(sub +)/(tau)(sub 0).

NTIS

Particle Decay; Spectra

20040012911 Stanford Linear Accelerator Center, Stanford, CA, USA

Study of Gluon versus Quark Fragmentation in Upsilon gg(gamma) and (positron)(electron) qq(overline) gamma square root of S equals 10 GeV

2003; 20 pp.; In English

Report No.(s): DE2003-813100; SLAC-PUB-9804; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Gluons; Quarks; Fragmentation

**71
ACOUSTICS**

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20040010675 WASHINGTON STATE UNIV VANCOUVER, Vancouver, WA, USA

Mental Representation of Auditory Sources

Lakatos, Stephen; Scavone, Gary; Beauchamp, James; Jan. 2002; 74 pp.; In English

Contract(s)/Grant(s): F49620-99-1-0293

Report No.(s): AD-A419095; AFRL-SR-AR-TR-03-0481; No Copyright; Avail: CASI; [A04](#), Hardcopy

The human auditory system possesses a remarkable ability to differentiate acoustic signals by the vibrational characteristics of their underlying sound sources. Understanding how listeners can detect, discriminate, classify, and remember acoustic source properties formed this project's overall goal. Using methods of signal detection, preliminary studies determined how listeners' sensitivity to auditory signals depends on whether attention is first directed to their acoustic features. Additional studies used perceptual mapping, new spectral measures, and novel data collection techniques to determine the acoustic cues listeners use to judge auditory perceptual similarity. A fundamental problem in auditory perception is to understand how listeners can perceive a sound source to be constant across wide variations in the sounds that the source can produce. Studies using simple and complex resonators demonstrated that listeners can represent the invariant properties of sound sources despite considerable variability in their excitation characteristics. Our ability to recognize previously heard sounds indicates that we encode features of acoustic sources in memory. Additional experiments used recognition and recall tasks, as well as measures of auditory 'realism,' to determine what cues persist in working and long-term memory. In sum,

our research has shed important initial light on the human representation of auditory source properties.

DTIC

Auditory Perception; Auditory Signals; Mental Performance; Noise (Sound)

20040010802 Naval Postgraduate School, Monterey, CA

San Clemente Island Undersea Range Acoustic Experiment, July 2002

Miller, Christopher W.; Kumar, Anurag; Nov. 4, 2003; 79 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418763; NPS-OC-04-001; No Copyright; Avail: CASI; [A05](#), Hardcopy

An at-sea data collection effort was conducted July 24-28, 2002 in support of the Naval Postgraduate School's Tactical Oceanography Course (OC-4270) off the San Clemente Island Undersea Range (SCIUR). The experiment configuration was designed to provide acoustic propagation measurements for transmission loss, detection range limitation, and acoustic variability in the 1-8 kHz frequency band. This report is provided to document contacts, experiment configuration, execution and collected data sets.

DTIC

Data Acquisition; Underwater Acoustics

73

NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20040010481

Effective Mass of the Electron Neutrino in Beta Decay

Farzan, Y.; Smirnov, A. Y.; Oct. 1997; 18 pp.; In English

Report No.(s): DE2003-812601; SLAC-PUB-9593; No Copyright; Avail: Department of Energy Information Bridge

In the presence of mixing between massive neutrino states, the distortion of the electron spectrum in beta decay is, in general, a function of several masses and mixing angles. For 3(nu)-schemes which describe the solar and atmospheric neutrino data, this distortion can be described by a single effective mass, under certain conditions. In the literature, two different definitions for the effective mass have been suggested. We show that for quasi-degenerate mass schemes (with an overall mass scale m and splitting $(\Delta m)^2$) the two definitions coincide up to $(\Delta m)^2/(\Delta m)^4$ corrections. We consider the impact of different effective masses on the integral energy spectrum. We show that the spectrum with a single mass can be used also to fit the data in the case of 4(nu)-schemes motivated, in particular, by the LSND results. In this case the accuracy of the mass determination turns out to be better than (10-15)%.

NTIS

Neutrinos; Radioactive Decay

20040010877 Youngstown State Univ., OH, USA

X-Ray Sources for the Triggering of Electromagnetic Pulses from Isomeric Materials

Carroll, James J.; Jan. 2002; 10 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0262

Report No.(s): AD-A418979; GC13-01-1; No Copyright; Avail: CASI; [A02](#), Hardcopy

Nuclear isomers can store tremendous amounts of energy for long times for example, the 31- year metastable excited state of $^{178}\text{m}_2\text{Hf}$ stores 2.445 MeV per nucleus, or 1.2 GigaJoules per gram. These special states of certain isotopes therefore may prove useful as nuclear batteries, provided that a means is found by which to control (trigger) their energy release upon demand. The concentration of current research is on the use of externally-produced photons to serve as such a trigger. At this point, much research must be conducted to test this process and measure the important physical parameters, from which an evaluation of the feasibility of applications may be conducted. The x-ray generating and support equipment purchased through this award are permitting improved investigations of triggered gamma emission from nuclear isomers and have created, at Youngstown State University's X-Ray Effects Laboratories (XEL and XEL2), a unique facility for these studies.

DTIC

Electromagnetic Pulses; X Ray Apparatus; Isomers

20040012990 Sandia National Labs., Albuquerque, NM

Hot Cell Facility (HCF) Safety Analysis Report

Mitchell, G. W.; Nagegeli, R. E.; Mahn, J. A.; Longley, S. W.; Philbin, J. S.; Dec. 06, 2000; 508 pp.; In English
Report No.(s): DE2003-769024; No Copyright; Avail: Department of Energy Information Bridge

This Safety Analysis Report (SAR) is prepared in compliance with the requirements of DOE Order 5480.23, Nuclear Safety Analysis Reports, and has been written to the format and content guide of DOE- STD-3009-94 Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Safety Analysis Reports. The Hot Cell Facility is a Hazard Category 2 nonreactor nuclear facility, and is operated by Sandia National Laboratories for the Department of Energy. This SAR provides a description of the HCF and its operations, an assessment of the hazards and potential accidents which may occur in the facility. The potential consequences and likelihood of these accidents are analyzed and described. Using the process and criteria described in DOE-STD-3009-94, safety-related structures, systems and components are identified, and the important safety functions of each SSC are described. Additionally, information which describes the safety management programs at SNL are described in ancillary chapters of the SAR.

NTIS

Nuclear Reactors; Safety Management

74 OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*.
For lasers see *36 Lasers and Masers*.

20040008889 NASA Langley Research Center, Hampton, VA, USA

Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature

Wu, Meng-Chou; Prosser, William H.; Rogowski, Robert S.; DeHaven, Stanton L.; [2003]; 2 pp.; In English; JANNAF 39th Combustion/27th Airbreathing Propulsion/21st Propulsion Systems Hazards/3rd Modeling and Simulation Joint Subcommittee Meeting, 1-5 Dec. 2003, Colorado Springs, CO, USA; No Copyright; Avail: CASI; [A01](#), Hardcopy

By using dual-wavelength fiber-optic Bragg gratings, a new technique has been developed for sensing both temperature and strain simultaneously in cryogenic temperature range. Two Bragg gratings with different wavelengths were inscribed at the same location in an optical fiber to form a dual-wavelength sensor. By measuring the wavelength shifts that resulted from the fiber being subjected to different temperatures and strains, the wavelength-dependent thermo-optic coefficients and photoelastic coefficients of the fiber were determined. These coefficients were used to construct the elements of the K matrix, which enables to determine inversely the strain and temperature changes by measuring the wavelength shifts of the dual-wavelength Bragg grating. In this study, measurements were made over the temperature range from room temperature down to about 10 K, addressing much of the low temperature range of cryogenic tanks. A structure transition of the optical fiber during the temperature change was found from about 70 K to 140 K. This transition caused splitting of the waveforms characterizing the Bragg gratings, and the determination of wavelength shifts was consequently complicated. Several alternatives are proposed to resolve this problem. The effectiveness and sensitivities of these measurements in different temperature ranges are discussed. The separation of two wavelengths for the dual-wavelength Bragg grating has been widened to increase the sensitivities of measurement; however, this separation can still be covered in the scanning range from single scanning laser.

Author

Bragg Gratings; Cryogenic Temperature; Fiber Optics; Strain Measurement; Wavelengths

20040008923 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan

High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks

Shimokawa, Fusao; Sakata, Tomomi; Makihara, Mitsuhiro; Katagiri, Yoshitada; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 31-36; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

We have improved our previously developed waveguide optical switch called Olive (oil-latching inter-facial-tension variation effect switch) by developing basic technologies for lowering the viscosity of the refractive-index-matching liquid and shortening the distance the liquid must travel. In combination with our previously developed highly accurate deep-groove fabrication with a high aspect ratio, batch injection of a very small amount of liquid, and high-performance sealing, these improvements enabled us to achieve a switching time of less than 10 ms while maintaining excellent optical characteristics.

This switching time, which is about one-tenth that of our previous Olive, breaks through an important threshold, allowing Olives to be used for optical crossconnects and add/drop multiplexers.

Author

Switching; High Speed; Thermocapillary Migration; Optical Equipment; Refractivity

20040008932 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan

Development of a Large-scale 3D MEMS Optical Switch Module

Yamamoto, Tsuyoshi; Yamaguchi, Johji; Sawada, Renshi; Uenishi, Yuji; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 37-42; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

A three-dimensional (3D) micro-electro-mechanical system (MEMS) optical switch, consisting of two-axis tilt mirror arrays and free-space optics, is a practical solution for constructing large-scale switching fabrics due to its high component density and low cost. The MEMS-mirror arrays developed by NTT are single-crystal silicon mirrors integrated with high-aspect ratio torsion springs and actuated by electrostatic forces. The free-space optics consist of low-cost high-precision polymer components assembled passively. A prototype module with 100-channel optical fiber input/output exhibited a low coupling loss of 4.0 dB and a switching time of 3 ms.

Author

Three Dimensional Models; Scale (Ratio); Microelectromechanical Systems; Switches; Optical Equipment

20040010326 Maryland Univ. Baltimore County, Catonsville, MD, USA

Holographic Optical Storage Using Photorefractive Polymers

Hayden, L. Michael; Strutz, Shane J.; Harris, Kristi; Ayachitula, Rajani; [2000]; 7 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-081-65; No Copyright; Avail: CASI; [A02](#), Hardcopy

The task for this report is to perform the basic research and develop a prototype benchtop holographic optical storage system based on photochromic and/or photorefractive polymers so that both permanent and erasable images may be stored and retrieved in the same mixed polymer medium. The task consist of: assembly and setup of the benchtop holographic storage system, including lasers, optics, and other ancillary equipment in a laboratory setting; and research and development of a suitable polymer matrix that will allow practical storage and retrieval of digital data. This will necessitate molecular design of the matrices involved and subsequent physics test to verify the characteristics of the matrices provide practical storage and retrieval.

Author

Holography; Photochromism; Polymers; Photorefractivity; Optical Memory (Data Storage)

20040010432

Emittance Measurements from a Laser Driven Electron Injector

Reis, D. A.; 2003; 20 pp.; In English

Report No.(s): DE2003-813359; SLAC-R-539; No Copyright; Avail: Department of Energy Information Bridge

Contents include the following: Introduction; Electron Beam Parameters (Electron emission from a metal cathode, Single particle dynamics for an rf gun, Single particle trajectories in the absence of acceleration, Electron beam characterization); Electron Injector (Electron beam line); Drive Laser; rf Systems and timing measurements (rf System, Timing measurements). NTIS

Emittance; Laser Pumping; Injectors; Electron Emission

20040010620

SLAC Design and Manufacturing Process of Sphere-Mounted Reflectors

Fuss, B.; Bell, B.; Bowden, G.; Ruland, R.; Oct. 1997; 18 pp.; In English

Report No.(s): DE2003-813115; SLAC-PUB-9823; No Copyright; Avail: Department of Energy Information Bridge

Sphere-Mounted Reflectors (SMRs) are used at SLAC for a variety of alignment purposes. They consist of a retroreflective set of mirrors mounted inside a hollowed out sphere. The most significant property of these is that the reflected beam emerging from the SMR is parallel to the incoming beam. The reflector is comprised of three reflective surfaces that are mutually orthogonal forming the geometrical equivalent of the corner of a cube.

NTIS

Reflectors; Design; Manufacturing

20040010625, Argonne National Lab., IL, USA

Complete Characterization of a Chaotic Optical Field using a High-Gain Self-Amplified Free-Electron Laser

Li, Y.; Krinsky, S.; Lewellen, J. W.; Kim, K. J.; Sajaev, V.; Jul. 2003; 20 pp.; In English

Report No.(s): DE2003-813314; SLAC-PUB-10062; No Copyright; Avail: Department of Energy Information Bridge

For centuries chaotic light sources were the only available objects for optical science. Study of chaotic light led to the development of such important concepts as ensemble-average coherence. However, the detailed temporal structure of the underlying optical field has never been fully characterized. We report on a complete characterization of such a field from a high-gain, selfamplified spontaneous-emission (SASE) free-electron laser (FEL). The temporal structure of the amplitude and phase are measured for a single pulse and the statistics over multiple pulses is determined.

NTIS

Optical Communication; Free Electron Lasers; Spontaneous Emission

20040010851 Alabama Univ., Huntsville, AL, USA

Phase-Synchronized Modal Testing of Mirror Membrane

Rogers, Ted; [2003]; 1 pp.; In English; Technology Days 2003, 2003, Huntsville, AL, USA; No Copyright; Avail: Other Sources; Abstract Only

The research reports on the development of a whole-field, system-level interferometry technique having phase-synchronized data acquisition and adjustable phase triggering. The technique utilizes a Fizeau interferometer, arbitrary function generator, oscilloscope, trigger filter, and CCD camera to determine the out-of-plane modal frequencies of a thin, highly reflective membrane. The technique generates phase-adjustable CCD camera trigger signals that are synchronized to the audio frequency excitation signal. The surface figures from the resulting interferograms were evaluated with fringe-following software and compared against that of an ideal membrane vibrating at resonance.

Author

Interferometry; Mirrors; Synchronism; Membranes

20040012861 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology

Greenhouse, Matt; Mott, Brent; Powell, Dan; Barclay, Rich; Hsieh, Wen-Ting; [2002]; 1 pp.; In English; American Astronomical Society Meeting, 5-9 Jan. 2003, Seattle, WA, USA; Copyright; Avail: Other Sources; Abstract Only

A research and development effort sponsored by the NASA Goddard Spaceflight Center (GSFC) is focused on applying Micro Opto Electromechanical Systems (MOEMS) technology to create a miniature Fabry-Perot tunable etalon for space and ground-based near infrared imaging spectrometer applications. Unlike previous devices developed for small-aperture telecommunications systems, the GSFC research is directed toward a novel 12 - 40 mm aperture for astrophysical studies, including emission line imaging of galaxies and nebulae, and multi-spectral redshift surveys in the 1.1 - 2.3 micron wavelength region. The MOEMS design features integrated electrostatic scanning of the 11-micron optical gap, and capacitance micrometry for closed loop control of parallelism within a 10-nm tolerance. The low thermal mass and inertia inherent in MOEMS devices allows for rapid cooling to the proposed 30 K operating temperature, and high frequency response. Achieving the proposed 6-nm aperture flatness (with an effective finesse of 50) represents the primary technical challenge in the current 12-mm prototype.

Author

Electromechanics; Tunable Filters; Technology Utilization; Fabry-Perot Interferometers; Apertures; Optics; Miniaturization

20040012894 Swedish Defence Research Establishment, Linköping

Improved Infrared Object Signature Calculations for SensorVision (Trade Mark) by the Use of RadTherm (Trade Mark)

Faeldt, D.; Ohlsson, J.; Sep. 2002; In English

Report No.(s): PB2004-101733; FOI-R-0574-SE; No Copyright; Avail: National Technical Information Service (NTIS)

At the development of IR-systems at the Swedish Defense Agency (FOI) the commercial software SensorVision(trademark) from MultiGen-Paradigm Incorporated is used for simulations of IR scenes. It is always desirable to increase the accuracy in the IR scene simulations. RadTherm(trademark) is a commercial software from ThermoAnalytics Incorporated which is suitable for very thorough temperature calculations of single objects. The two main advantages with RadTherm(trademark), as compared to SensorVision(trademark), are its capability to perform heat transfer calculations in three dimensions and the possibility to include internal heat sources in an object. This makes it very suitable for thermal

calculations on, for instance vehicles. Possibilities to import temperatures to SensorVision(trademark) from an external source have been investigated and the different ways of retrieving output-data from RadTherm(trademark) evaluated. A program has been constructed in Visual C++ which uses data from a RadTherm(trademark) simulation to set temperatures on a single object in real-time in SensorVision(trademark).

NTIS

Infrared Signatures; Computer Programs

75

PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 *Geophysics*. For space plasmas see 90 *Astrophysics*.

20040008875 Ohio Aerospace Inst., USA

Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis

Gilland, James H.; Mikekkides, Ioannis; Mikellides, Pavlos; Gregorek, Gerald; Marriott, Darin; [2004]; 39 pp.; In English Contract(s)/Grant(s): NAG3-2601; No Copyright; Avail: CASI; [A03](#), Hardcopy

This project has been a multiyear effort to assess the feasibility of a key process inherent to virtually all fusion propulsion concepts: the expansion of a fusion-grade plasma through a diverging magnetic field. Current fusion energy research touches on this process only indirectly through studies of plasma divertors designed to remove the fusion products from a reactor. This project was aimed at directly addressing propulsion system issues, without the expense of constructing a fusion reactor. Instead, the program designed, constructed, and operated a facility suitable for simulating fusion reactor grade edge plasmas, and to examine their expansion in an expanding magnetic nozzle. The approach was to create and accelerate a dense (up to $10(\exp 20)/\text{m}$) plasma, stagnate it in a converging magnetic field to convert kinetic energy to thermal energy, and examine the subsequent expansion of the hot (100's eV) plasma in a subsequent magnetic nozzle. Throughout the project, there has been a parallel effort between theoretical and numerical design and modelling of the experiment and the experiment itself. In particular, the MACH2 code was used to design and predict the performance of the magnetoplasma dynamic (MPD) plasma accelerator, and to design and predict the design and expected behavior for the magnetic field coils that could be added later. Progress to date includes the theoretical accelerator design and construction, development of the power and vacuum systems to accommodate the powers and mass flow rates of interest to our research, operation of the accelerator and comparison to theoretical predictions, and computational analysis of future magnetic field coils and the expected performance of an integrated source-nozzle experiment.

Author

Magnetic Nozzles; Fusion Propulsion; Plasma Accelerators; Magnetic Fields; Experiment Design

20040010366 California Univ., San Diego, La Jolla, CA, USA

Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster

Raitses, Y.; Staack, D.; Dunaevsky, A.; Dorf, L.; Fisch, N. J.; Mar. 2003; 18 pp.; In English Report No.(s): DE2003-812923; PPPL-3796; No Copyright; Avail: Department of Energy Information Bridge

A 2 kW Hall thruster was developed, built and operated in an upgraded vacuum facility. The thruster performance and parameters of the plasma flow were measured by new diagnostics for plume measurements and plasma measurements inside the thruster channel. The thruster demonstrated efficient operation in terms of propellant and current utilization efficiencies in the input power range of 0.5-3.5 kW. Preliminary measurements of the ion energy spectra from the thruster axis region and the distribution of plasma parameters in the vicinity of the thruster exit are reported.

NTIS

Diagnosis; Flow Measurement; Magnetohydrodynamic Flow; Plasmas (Physics)

20040010504 Princeton Univ., NJ

New Interpretation of Alpha-Particle-Driven Instabilities in Deuterium-Tritium Experiments on the Tokamak Fusion Test Reactor

Nazikian, R.; Kramer, G. J.; Cheng, C. Z.; Gorelenkov, N. N.; Berk, H. L.; Mar. 2003; In English Report No.(s): DE2003-813605; PPPL-3800; No Copyright; Avail: National Technical Information Service (NTIS)

The original description of alpha-particle-driven instabilities in the Tokamak Fusion Test Reactor (TFTR) in terms of

Toroidal Alfvén Eigenmodes (TAEs) remained inconsistent with three fundamental characteristics of the observations: (1) the variation of the mode frequency with toroidal mode number, (2) the chirping of the mode frequency for a given toroidal mode number, and (3) the anti-ballooning density perturbation of the modes. It is now shown that these characteristics can be explained by observing that cylindrical-like modes can exist in the weak magnetic shear region of the plasma that then make a transition to TAEs as the central safety factor decreases in time.

NTIS

Tokamak Devices; Deuterium; Tritium

20040010517 Oak Ridge National Lab., TN, Lehigh Univ., Bethlehem, PA, USA, Lawrence Livermore National Lab., Livermore, CA, General Atomics Co., San Diego, CA

Demonstration in the DIII-D Tokamak of an Alternate Baseline Scenario for ITER and Other Burning Plasma Experiments

Luce, T. C.; Wade, M. R.; Ferron, J. R.; Hyatt, A. W.; Kellman, A. G.; Nov. 2002; 12 pp.; In English

Report No.(s): DE2003-813953; GA-A24145; No Copyright; Avail: Department of Energy Information Bridge

Discharges which can satisfy the high gain goals of burning plasma experiments have been demonstrated in the DIII-D tokamak in stationary conditions with relatively low plasma current. A figure of merit for fusion gain β_N has been maintained at values corresponding to $Q=10$ operation in a burning plasma for greater than 6 s or 36 τ_E and $2\tau_R$. The key element is the relaxation of the current profile to a stationary state with q_{min} greater than 1, which allows stable operation up to the no-wall ideal β_N limit. These plasmas maintain particle balance by active pumping rather than transient wall conditioning. The reduced current lessens significantly the potential for structural damage in the event of a major disruption.

NTIS

Tokamak Devices; Plasma Currents

20040010518 Oak Ridge National Lab., TN, Lehigh Univ., Bethlehem, PA, USA, Lawrence Livermore National Lab., Livermore, CA, General Atomics Co., San Diego, CA

Stationary High-Performance Discharges in the DIII-D Tokamak

Luce, T. C.; Wade, M. R.; Ferron, J. R.; Hyatt, A. W.; Kellman, A. G.; Nov. 2002; 34 pp.; In English

Report No.(s): DE2003-813954; GA-A24146; No Copyright; Avail: Department of Energy Information Bridge

Discharges which can satisfy the high gain goals of burning plasma experiments have been demonstrated in the DIII-D tokamak under stationary conditions at relatively low plasma current. A figure of merit for fusion gain has been maintained at values corresponding to $Q=10$ operation in a burning plasma for greater than 6 s or 36 τ_E and $2\tau_R$. The key element is the relaxation of the current profile to a stationary state with q_{min} greater than 1. In the absence of sawteeth and fishbones, stable operation has been achieved up to the estimated no-wall β_N limit. Feedback control of the energy content and particle inventory allow reproducible, stationary operation.

NTIS

Tokamak Devices; Plasma Currents

20040010524 Oak Ridge National Lab., TN, Lehigh Univ., Bethlehem, PA, USA, Lawrence Livermore National Lab., Livermore, CA, Oak Ridge Inst. for Science and Education, TN

Achieving and Sustaining Steady-State Advanced Tokamak Conditions on DIII-D

Wade, M. R.; Murakami, M.; Brennan, D. P.; Casper, T. A.; Ferron, J. R.; Sep. 2002; 12 pp.; In English

Report No.(s): DE2003-813955; GA-A24150; No Copyright; Avail: Department of Energy Information Bridge

Recent experiments on the DIII-D tokamak have demonstrated the feasibility of sustaining advanced tokamak conditions that combine high fusion power density, high bootstrap current fraction and high non-inductive current fractions for several energy confinement times. The duration of such conditions is limited only by resistive relaxation of the current density profile. Modeling studies indicate that the application of off-axis ECCD will be able to maintain a favorable current density profile for several seconds.

NTIS

Tokamak Devices; Steady State

20040010525 Oak Ridge Inst. for Science and Education, TN, General Atomics Co., San Diego, CA

Physics and Control of ELMing H-Mode Negative Central Shear Advanced Tokamak Scenario Based on Experimental Profiles for ITER

Lao, L. L.; Chan, V. S.; Evans, T. E.; Humphreys, D. A.; Leuer, J. A.; Nov. 2002; 14 pp.; In English

Report No.(s): DE2003-813956; GA-A24157; No Copyright; Avail: Department of Energy Information Bridge

The goal of magnetic fusion research is to develop fusion energy as an economical and viable energy source. Two of the major research elements are the development of the advanced tokamak (AT) configurations with good confinement and improved stability at high and steady-state burning plasmas, and the study of these configurations under burning plasma conditions. An international fusion energy advanced tokamak burning plasma machine, ITER-FEAT, has recently been proposed to study inductive and steady-state burning plasmas, which offers an opportunity to continue development at the AT path.

NTIS

Tokamak Devices; Confinement

20040010527 General Atomics Co., San Diego, CA

General Atomics Fusion Theory Program Annual Report for Fiscal Year 2002

Dec. 2002; 36 pp.; In English

Report No.(s): DE2003-814002; GA-A24232; No Copyright; Avail: Department of Energy Information Bridge

The dual objective of the fusion theory program at General Atomics (GA) is to significantly advance the scientific understanding of the physics of fusion plasmas and to support the DIII-D and other tokamak experiments. The program plan is aimed at contributing significantly to the Fusion Energy Science and the Tokamak Concept Improvement goals of the Office of Fusion Energy Sciences (OFES).

NTIS

Plasmas (Physics); Project Planning; Tokamak Devices

20040010528 Lawrence Livermore National Lab., Livermore, CA, Princeton Univ., NJ, Oak Ridge National Lab., TN, General Atomics Co., San Diego, CA

ELM Particle and Energy Transport in the SOL and Divertor of DIII-D

Fenstermacher, M. E.; Leonard, A. W.; Snyder, P. B.; Boedo, J. A.; Colchin, R. J.; Apr. 2003; 48 pp.; In English

Report No.(s): DE2003-814005; GA-A24273; No Copyright; Avail: Department of Energy Information Bridge

Results from a series of dedicated experiments measuring the effect of particle and energy pulses from Type-I Edge Localized Modes (ELMs) in the DIII-D scrape-off layer (SOL) and divertor are compared with a simple model of ELM propagation in the boundary plasma. The simple model asserts that the propagation of ELM particle and energy perturbations is dominated by ion parallel convection along SOL fields lines and the recovery from the ELM perturbation is determined by recycling physics. Time scales associated with the initial changes of boundary plasma parameters are expected to be on the order of the ion transit time from the outer midplane, where the ELM instability is initiated, to the divertor targets. To test the model, the ion convection velocity is changed in the experiment by varying the plasma density.

NTIS

Diverters; Transit Time; Plasma Density; Energy Transfer

20040010633 European Atomic Energy Community, Madrid, Spain, Japan Atomic Energy Research Inst., Ibaraki, Japan, Lehigh Univ., Bethlehem, PA, USA, General Atomics Co., San Diego, CA

Characteristics of the H-Mode Pedestal and Extrapolation to ITER

Osborne, T. H.; Cordey, J. G.; Groebner, R. J.; Hatae, T.; Hubbard, A.; Nov. 2002; 16 pp.; In English

Report No.(s): DE2003-813957; GA-A24159; No Copyright; Avail: Department of Energy Information Bridge

The peeling-ballooning mode model for edge stability along with a model for the H-mode transport barrier width is used as an approach to estimating the H-mode pedestal conditions in ITER. Scalings of the barrier width based on ion-orbit loss, neutral penetration, and turbulence suppression are examined and empirical scalings of the barrier width are presented. An empirical scaling for the pedestal is derived based on ideas from stability and the empirical with scaling. The impact of the stability model and other factors on ELM size is discussed.

NTIS

Tokamak Devices; Plasma Control

20040010634 Oak Ridge National Lab., TN, Princeton Univ., NJ, General Atomics Co., San Diego, CA

Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak

Lohr, J.; Gorelov, Y. A.; Kajiwara, K.; Ponce, D.; Callis, R. W.; Sep. 2002; 16 pp.; In English

Report No.(s): DE2003-813958; GA-A24168; No Copyright; Avail: Department of Energy Information Bridge

The DIII-D gyrotron complex for electron cyclotron heating (ECH) and electron cyclotron current drive (ECCD) has been expanded to include five operational gyrotrons with a sixth being commissioned. The generated rf power exceeds 4.0 MW and the transmission lines deliver about 80% of this power to the tokamak.

NTIS

Cyclotron Resonance Devices; Cyclotron Radiation; Radio Frequencies; Transmission Lines

20040010635 Princeton Univ., NJ, General Atomics Co., San Diego, CA

Discharge Improvement through Control of Neoclassical Tearing Modes by Localized ECCD in DIII-D

Prater, P.; La Haye, R. J.; Lohr, J.; Luce, T. C.; Petty, C. C.; Oct. 2002; 24 pp.; In English

Report No.(s): DE2003-813959; GA-A24179; No Copyright; Avail: Department of Energy Information Bridge

Experiments on the DIII-D tokamak have shown that in many cases the plasma performance is limited by the onset of neoclassical tearing modes. Higher order modes like the $m=3/n=2$ mode limit the achievable plasma pressure/magnetic pressure and reduce the energy confinement time. Lower order modes like the $m=2/n=1$ mode lead to a large loss of plasma pressure and frequency to a disruption. For a reactor these limitations may make the difference between economic success and failure. These observations provide strong motivation for control of the magnetohydrodynamic (MHD) instabilities.

NTIS

Magnetohydrodynamic Stability; Plasma Control; Tearing

20040010636 Lawrence Livermore National Lab., Livermore, CA, Sandia National Labs., Albuquerque, NM, California Univ., Los Angeles, CA, USA, General Atomics Co., San Diego, CA

Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D

Leonard, A. W.; Osborne, T. H.; Fenstermacher, M. E.; Groebner, R. J.; Groth, M.; Nov. 2002; 34 pp.; In English

Report No.(s): DE2003-813961; GA-A24204; No Copyright; Avail: Department of Energy Information Bridge

The reduction in size of Type I edge localized modes (ELMs) with increasing density is explored in DIII-D for the purpose of studying the underlying transport of ELM energy. The separate convective and conductive transport of energy due to an ELM is determined by Thomson scattering measurements of electron density and temperature in the pedestal. The conductive transport from the pedestal during an ELM decreases with increasing density, while the convective transport remains nearly constant. The scaling of the ELM energy loss is compared with an edge stability model.

NTIS

Particles; Tokamak Devices; Boundary Layers; Thomson Scattering; Energy Transfer

20040010663 Japan Atomic Energy Research Inst., Ibaraki, Japan, Oak Ridge National Lab., TN, General Atomics Co., San Diego, CA

Quantitative Tests of ELMs as Intermediate n Peeling-Ballooning Modes

Lao, L. L.; Snyder, P. B.; Leonard, A. W.; Oikawa, T.; Osbourne, T. H.; Mar. 2003; 24 pp.; In English

Report No.(s): DE2003-814006; GA-A24281; No Copyright; Avail: Department of Energy Information Bridge

Several testable features of the working model of edge localized modes (ELMs) as intermediate toroidal mode number peeling-ballooning modes are evaluated quantitatively using DIII-D and JT-60U experimental data and the ELITE MHD stability code. These include the hypothesis that ELM sizes are related to the radial widths of the unstable MHD modes, the unstable modes have a strong ballooning character localized in the outboard bad curvature region, and ELM size generally becomes smaller at high edge collisionality. ELMs are triggered when the growth rates of the unstable MHD modes become significantly large. These testable features are consistent with many ELM observations in DIII-D and JT-60U discharges.

NTIS

Performance Tests; Amount; Ballooning Modes; Magnetohydrodynamic Stability

20040010668 Columbia Univ., New York, NY, USA, Princeton Univ., NJ, General Atomics Co., San Diego, CA

Resistive Wall Modes and Plasma Rotation in DIII-D

Reimerdes, H.; Chu, M. S.; Garofalo, A. M.; Jackson, G. L.; Jensen, T. H.; Jul. 2003; 16 pp.; In English

Report No.(s): DE2003-814010; GA-A24344; No Copyright; Avail: Department of Energy Information Bridge

The stabilization of the resistive wall mode (RWM) by toroidal plasma rotation has been demonstrated in neutral beam heated DIII-D discharges for values of β up to 70% above the no-wall stability limit. The stabilizing effect of plasma rotation is explained by assuming some dissipation, which is caused by the rapid plasma flow through a perturbed magnetic field. Sufficient plasma rotation is predicted to extend the operating regime of tokamaks from the conventional no-wall(β) limit up to the ideal wall(β) limit. While plasma rotation has a stabilizing effect on the RWM, a finite amplitude RWM also increases the drag on the plasma, which leads to a non-linear interaction between the RWM and the plasma rotation. A good understanding of the underlying dissipation mechanism is crucial for reliable predictions of the plasma rotation which will be required for wall-stabilization in a burning-plasma experiment. In order to measure the stabilizing effect of plasma rotation on the RWM the technique of active MHD spectroscopy, which was previously applied to MHD modes at frequencies above 10 kHz, is extended to frequencies of a few Hz.

NTIS

Rotation; Magnetohydrodynamic Flow; Neutral Beams; Toroidal Plasmas

20040010669 Princeton Univ., NJ

Comparison of Quantum Mechanical and Classical Trajectory Calculations of Cross Sections for Ion-Atom Impact Ionization of Negative- and Positive-Ions for Heavy Ion Fusion Applications

Kaganovich, I. D.; Startsev, E. A.; Davidson, R. C.; May 2003; 24 pp.; In English

Report No.(s): DE2003-814013; PPPL-3812; No Copyright; Avail: Department of Energy Information Bridge

Stripping cross sections in nitrogen have been calculated using the classical trajectory approximation and the Born approximation of quantum mechanics for the outer shell electrons of 3.2 GeV I(sup -) and Cs(sup +) ions. A large difference in cross section, up to a factor of six, calculated in quantum mechanics and classical mechanics, has been obtained. Because at such high velocities the Born approximation is well validated, the classical trajectory approach fails to correctly predict the stripping cross sections at high energies for electron orbitals with low ionization potential.

NTIS

Heavy Ions; Collision Parameters; Ion Stripping; Ionization Potentials

20040010670 Princeton Univ., NJ

Self-Consistent System of Equations for a Kinetic Description of the Low-Pressure Discharges Accounting for the Nonlocal and Collisionless Electron Dynamics

Kaganovich, I. D.; Polomarov, O.; May 2003; 38 pp.; In English

Report No.(s): DE2003-814016; PPPL-3814; No Copyright; Avail: Department of Energy Information Bridge

In low-pressure discharges, when the electron mean free path is larger or comparable with the discharge length, the electron dynamics is essentially nonlocal. Moreover, the electron energy distribution function (EEDF) deviates considerably from a Maxwellian. Therefore, an accurate kinetic description of the low-pressure discharges requires knowledge of the nonlocal conductivity operator and calculation of the nonMaxwellian EEDF. The previous treatments made use of simplifying assumptions: a uniform density profile and a Maxwellian EEDF. In the present study a self-consistent system of equations for the kinetic description of nonlocal, nonuniform, nearly collisionless plasmas of low-pressure discharges is derived. It consists of the nonlocal conductivity operator and the averaged kinetic equation for calculation of the nonMaxwellian EEDF. The importance of accounting for the nonuniform plasma density profile on both the current density profile and the EEDF is demonstrated.

NTIS

Plasma Heating; Collisionless Plasmas; Kinetic Equations

20040010677 Columbia Univ., New York, NY, USA, Oak Ridge National Lab., TN, Princeton Univ., NJ, General Atomics Co., San Diego, CA

Advanced Tokamak Operation Using the DIII-D Plasma Control System

Humphreys, D. A.; Ferron, J. R.; Garofalo, A. M.; Hyatt, A. W.; Jernigan, T. C.; Oct. 2002; 16 pp.; In English

Report No.(s): DE2003-814025; GA-A24087; No Copyright; Avail: Department of Energy Information Bridge

The principal focus of experimental operations in the DIII-D tokamak is the advanced tokamak (AT) regime to achieve, which requires highly integrated and flexible plasma control. In a high performance advanced tokamak, accurate regulation of the plasma boundary, internal profiles, pumping, fueling, and heating must be well coordinated with MHD control action to stabilize such instabilities as tearing modes and resistive wall modes. Sophisticated monitors of the operational regime must provide detection of off-normal conditions and trigger appropriate safety responses with acceptable levels of reliability. Many

of these capabilities are presently implemented in the DIII-D plasma control system (PCS), and are now in frequent or routine operational use. The present work describes recent development, implementation, and operational experience with AT regime control elements for equilibrium control, MHD suppression, and off-normal event detection and response.

NTIS

Plasmas (Physics); Operational Problems; Tokamak Devices

20040010712 Oak Ridge National Lab., TN, Lawrence Livermore National Lab., Livermore, CA, Texas Univ., Austin, TX, USA, Lehigh Univ., Bethlehem, PA, USA

Advanced Tokamak Profile Evolution in DIII-D

Murakami, M.; Wade, M. R.; DeBoo, J. C.; Greenfield, C. M.; Luce, T. C.; Nov. 2002; 30 pp.; In English

Report No.(s): DE2003-813979; GA-A24209; No Copyright; Avail: Department of Energy Information Bridge

The attractiveness of any fusion power system relies heavily on providing high power density and high duty factor. The DIII-D Advanced Tokamak (AT) program is aimed at developing the physics basis and plasma control methods needed for steady state high performance operation. Steady-state operation requires that the plasma current be driven noninductively. High bootstrap current is desired to minimize the recirculating power. The achievement of a self-consistent solution that combines high bootstrap current fraction and high fusion gain requires moderately high safety factor and high values of normalized beta. Both experimental experience and simulations suggest that a relatively small amount of current driven at about the half radius, combined with bootstrap and neutral beam current drive, can result in a steady state current profile that is compatible with a high equilibrium.

NTIS

Tokamak Devices; Neutral Beams; Plasma Control; Plasma Currents; Steady State

20040010798 Princeton Univ., NJ

Multi-Grid Particle-in-cell Simulations of Plasma Microturbulence

Lewandowski, J. L. V.; Jun. 2003; 38 pp.; In English

Report No.(s): DE2003-814681; PPPL-3823; No Copyright; Avail: Department of Energy Information Bridge

A new scheme to accurately retain kinetic electron effects in particle-in-cell (PIC) simulations for the case of electrostatic drift waves is presented. The splitting scheme, which is based on exact separation between adiabatic and on adiabatic electron responses, is shown to yield more accurate linear growth rates than the standard df scheme. The linear and nonlinear elliptic problems that arise in the splitting scheme are solved using a multi-grid solver. The multi-grid particle-in-cell approach offers an attractive path, both from the physics and numerical points of view, to simulate kinetic electron dynamics in global toroidal plasmas.

NTIS

Plasmas (Physics); Turbulence; Simulation

20040010800 Princeton Univ., NJ

Improved Conservation Properties for Particle-in-cell Simulations with Kinetic Electrons

Lewandowski, J. L. V.; Jun. 2003; 22 pp.; In English

Report No.(s): DE2003-814690; PPPL-3826; No Copyright; Avail: Department of Energy Information Bridge

It is shown that a simple algorithm which exactly segregates between adiabatic and non-adiabatic electrons in particle-in-cell simulations of drift modes yields excellent conservation properties (e.g. particle number, energy) compared to the conventional df scheme. The removal of the free streaming term in the evolution of the marker weight is shown to be responsible for the improved linear and nonlinear properties of the simulated plasma.

NTIS

Plasmas (Physics); Kinetics; Electrons

20040012874 Texas Univ., Austin, TX, USA, General Atomics Co., San Diego, CA

Ece Radiometer Upgrade on the DIII-D Tokamak

Austin, M. E.; Lohr, J.; Aug. 2002; 18 pp.; In English

Report No.(s): DE2003-813649; GA-A24030; No Copyright; Avail: Department of Energy Information Bridge

The electron cyclotron emission (ECE) heterodyne radiometer diagnostic on DIII-D has been upgraded with the addition of eight channels for a total of 40. The new, higher frequency channels allow measurements of electron temperature into the magnetic axis in discharges at maximum field, 2.15 T. the complete set now extends over the full usable range of second

harmonic emission frequencies at 2.0 T covering radii from the outer edge inward to the location of third harmonic overlap on the high field side. Full coverage permits the measurement of heat pulses and magnetohydrodynamic (MHD) fluctuations on both sides of the magnetic axis.

NTIS

Radiometers; Tokamak Devices; Magnetohydrodynamics; Heat Measurement

20040012877 Princeton Univ., NJ

Electrostatic Probe with Shielded Probe Insulator Tube for Low Disturbing Plasma Measurements in Hall Thrusters

Staack, D.; Raites, Y.; Fisch, N. J.; Jul. 2003; 36 pp.; In English

Report No.(s): DE2003-814705; PPPL-3838; No Copyright; Avail: Department of Energy Information Bridge

Electrostatic probes are widely used to measure spatial plasma parameters of the quasineutral plasma in Hall thrusters and similar EOEB electric discharge devices. Significant perturbations of the plasma, induced by such probes, can mask the actual physics involved in operation of these devices. In Hall thrusters, probe induced perturbations can produce changes in the discharge current and plasma parameters on the order of their steady state values. These perturbations, are explored by varying the material, penetration distance and residence time of various probe designs. A possible cause of these perturbations appears to be the secondary electron emission, induced by energetic plasma electrons, from insulator ceramic tubes in which the probe wire is inserted. A new probe in which a low secondary electron emission material, such as metal, shields the probe ceramic tube, is shown to function without producing such large perturbations. A segmentation of this shield further prevents probe-induced perturbations, by not shortening the plasma through the conductive shield. In a set of experiments with a segmented shield probe, the thruster was operated in the input power range of 500-2.5 kW and discharge voltages of 200-500 V, while the probe induced perturbations of the discharge current were below 4% of its steady state value in the region in which 90% of the voltage drop takes place.

NTIS

Electrostatic Probes; Shielding; Insulation; Plasmas (Physics); Pulsed Plasma Thrusters

20040012892 Forschungszentrum Karlsruhe G.m.b.H., Karlsruhe, Germany, Japan Atomic Energy Research Inst., Ibaraki, Japan, General Atomics Co., San Diego, CA

Advanced High Performance Solid Wall Blanket Concepts

Wong, C. P. C.; Malang, S.; Nishio, S.; Raffray, R.; Sagara, S.; Apr. 2002; 30 pp.; In English

Report No.(s): DE2003-813642; GA-A23900; No Copyright; Avail: Department of Energy Information Bridge

First wall and blanket design is a crucial element in the performance and acceptance of a fusion power plant. High temperature structural and breeding materials are needed for high thermal performance. A suitable combination of structural design with the selected materials is necessary for D-T fuel sufficiency. Whenever possible, low afterheat, low chemical reactivity and low activation materials are desired to achieve passive safety and minimize the amount of high-level waste. Of course the selected fusion first wall and blanket design will have to match the operational scenarios of high performance plasma.

NTIS

High Temperature; Breeding (Reproduction); Temperature Effects

20040012901 Columbia Univ., New York, NY, USA, Princeton Univ., NJ, General Atomics Co., San Diego, CA

Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls'

Strait, E. J.; Chu, M. S.; Garofalo, A. M.; La Haye, R. J.; Okabayashi, M.; Sep. 2002; 24 pp.; In English

Report No.(s): DE2003-813662; GA-C24119; No Copyright; Avail: Department of Energy Information Bridge

The most serious instabilities in the tokamak are those described by ideal magneto-hydrodynamic theory. These modes limit the stable operating space of the tokamak. The ideal MHD calculations predict the stable operating space of the tokamak may be approximately doubled when a perfectly conducting metal wall is placed near the plasma boundary, compared to the case with no wall (free boundary). The unstable mode distortions of the plasma column cannot bulge out through a perfectly conducting wall.

NTIS

Feedback; Plasmas (Physics); Image Velocity Sensors; Magnetohydrodynamic Stability; Feedback Control

20040012903 Communications and Power Industries, Inc., Palo Alto, CA, USA, Princeton Univ., NJ, Massachusetts Inst. of Tech., Cambridge, MA, USA, General Atomics Co., San Diego, CA

Maturing ECRF Technology for Plasma Control

Callis, R. W.; Cary, W. P.; Chu, S.; Doane, J. L.; Ellis, R. A.; Sep. 2002; 18 pp.; In English

Report No.(s): DE2003-813661; GA-A24118; No Copyright; Avail: Department of Energy Information Bridge

The availability of high power, long pulse length, high frequency, gyrotrons has opened the opportunity for enhanced scientific results on magnetic confinement devices for fusion research worldwide. This has led to successful experiments on electron cyclotron heating, electron cyclotron current drive, non-inductive tokamak operation, tokamak energy transport, suppression of instabilities and advanced profile control leading to enhanced performance.

NTIS

Plasma Control; Tokamak Devices; Electron Cyclotron Heating

76

SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20040010414

Measurement of the Overline Beta D1 Overline nv Partial Width and Form Factor Parameters

2003; 16 pp.; In English

Report No.(s): DE2003-813077; SLAC-PUB-9776; No Copyright; Avail: Department of Energy Information Bridge

We have studied the decay $B \rightarrow D_l \nu$, where $l = e$ or μ . From a fit to the differential decay rate $d\Gamma/dw$ we measure the rate normalization $FD(1)$ straight line V_{cb} straight line and form factor slope $p(\sup 2)(\sub D)$, and, using measured values of Γ_B , find $\Gamma(B \rightarrow D_l \nu) = (12.0 \pm 0.9 \pm 2.1) \text{ ns}^{-1}$ to the minus 1 power.

NTIS

Decay Rates; Form Factors

20040010415

Search for Neutrinoless τ Decays Involving π^0 or η Mesons

2003; 14 pp.; In English

Report No.(s): DE2003-813088; SLAC-PUB-9790; No Copyright; Avail: Department of Energy Information Bridge

We have searched for lepton family number violating decays of the τ lepton using final states with an electron or a muon and one or more π^0 or η mesons but no neutrinos. The data used in the search were collected with the CLEO II detector at the Cornell Electron Storage Ring (CESR) and correspond to an integrated luminosity of 4.68 fb to the minus 1 power. No evidence for signals was found, resulting in much improved limits on the branching fractions for the one-meson modes and the first upper limits for the two-meson modes.

NTIS

Mesons; Particle Decay; Neutrinos

20040010440 Oak Ridge National Lab., TN, Crystal IS, Inc., Latham, NY, USA

Simulation of Transport Phenomena in Aluminum Nitride Single-Crystal Growth

de Almeida, V. F.; Rojo, J. C.; 2000; 44 pp.; In English

Report No.(s): DE2003-814469; C/ORNL-00-0587; No Copyright; Avail: Department of Energy Information Bridge

The goal of this project is to apply advanced computer-aided modeling techniques for simulating coupled radiation transfer present in the bulk growth of aluminum nitride (AlN) single-crystals. Producing and marketing high-quality single-crystals of AlN is currently the focus of Crystal IS, Inc., which is engaged in building a new generation of substrates for electronic and optical-electronic devices. Modeling and simulation of this company's proprietary innovative processing of AlN can substantially improve the understanding of physical phenomena, assist design, and reduce the cost and time of research activities. This collaborative work supported the goals of Crystal IS, Inc. in process scale-up and fundamental analysis with promising computational tools.

NTIS

Aluminum Nitrides; Radiative Transfer; Single Crystals; Transport Properties; Crystal Growth

20040010477 South Carolina State Univ., Orangeburg, SC, USA

Properties of Doped Bi-Based Superconductors

Payne, J. E.; Aug. 2001; 18 pp.; In English

Report No.(s): DE2003-771351; DOE/ER/45630-1; No Copyright; Avail: Department of Energy Information Bridge

The sample production is progressing with the production of highly doped single crystal samples and bulk samples. (1) Single crystals of BiSCCO materials doped with Fe are being studied. It had been observed that the starting compound used for iron doping affects the transition temperature. The effect is being examined with both resistance measurements and thermal conductivity measurements. (2) In attempts to study the effects of high levels of gold and silver samples are being prepared using pellets of the BiSCCO materials with doping levels as high as 20%. These samples will be studied using resistance versus temperature measurements and a SQUID magnetometer.

NTIS

Superconducting Films; High Temperature Superconductors

20040012802 Army Armament Research, Development and Engineering Center, Watervliet, NY

Thermal Effusivity as a Non-Destructive Method to Characterize Thin Films

Fleszar, Mark F.; Nov. 2003; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A419354; ARCCB-TR-03014; No Copyright; Avail: CASI; [A02](#), Hardcopy

Mathis Instruments Thermal Conductivity Probe (TC Probe) offers a potential non-destructive method for looking at changes in a 3- to 5-mil polymer coating. The TC Probe is based on a modified hot wire technique, operating under constant current conditions. The temperature of the heating element is monitored during sample testing, and changes in the temperature at the interface between the probe and sample surface, over the testing time, are continually measured. Because the coatings are thin, the potential for heat transfer into the substrate is a potential problem. Care must be taken to assure that the analysis time is set to eliminate or at least minimize thermal penetration. The effusivity is a function of the density, heat capacity, and thermal conductivity. As a polymer coating degrades as a result of environmental exposure, the structure of the polymer changes. Chain scission reduces molecular weight and shorter polymer chains become more mobile. Resulting changes in the polymer density and thermal conductivity can be observed using the TC Probe.

DTIC

Thermal Conductivity; Thin Films

20040012976 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Passive Superconducting Shielding: Experimental Results and Computer Models

Warner, Brent; Kamiya, Koki; [2003]; 1 pp.; In English; Cryogenic Engineering Conference, 22-26 Sep. 2003, Anchorage, AK, USA; Copyright; Avail: Other Sources; Abstract Only

Passive superconducting shielding for magnetic refrigerators has advantages over active shielding and passive ferromagnetic shielding in that it is lightweight and easy to construct. However, it is not as easy to model and does not fail gracefully. Failure of a passive superconducting shield may lead to persistent flow and persistent currents. Unfortunately, modeling software for superconducting materials is not as easily available as is software for simple coils or for ferromagnetic materials. This paper will discuss ways of using available software to model passive superconducting shielding.

Author

Ferromagnetic Materials; Magnetic Cooling; Superconductors (Materials); Cryogenics; Computer Programs; Magnetic Shielding

77

PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics*, *73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

20040010365 University of Southern California, Los Angeles, CA, USA

Two-Loop Helicity Amplitudes for Quark-Gluon Scattering in QCD and Gluino-Gluon Scattering in Supersymmetric Yang-Mills Theory

Bern, Z.; De Freitas, A.; Dixon, L.; Apr. 2003; 82 pp.; In English

Report No.(s): DE2003-812991; SLAC-PUB-9675; UCLA/03-TEP-10, DESY 03-034; No Copyright; Avail: Department of Energy Information Bridge

We present the two-loop QCD helicity amplitudes for quark-gluon scattering, and for quark-antiquark annihilation into two gluons. These amplitudes are relevant for next-to-next-to-leading order corrections to (polarized) jet production at hadron colliders. We give the results in the 't Hooft-Veltman and four-dimensional helicity (FDH) variants of dimensional regularization. The transition rules for converting the amplitudes between the different variants are much more intricate than for the previously discussed case of gluon-gluon scattering. Summing our two-loop expressions over helicities and colors, and converting to conventional dimensional regularization, gives results in complete agreement with those of Anastasiou, Glover, Oleari and Tejeda-Yeomans. We describe the amplitudes for 2 yields 2 scattering in pure $N = 1$ supersymmetric Yang-Mills theory, obtained from the QCD amplitudes by modifying the color representation and multiplicities, and verify supersymmetry Ward identities in the FDH scheme.

NTIS

Quarks; Helices; Quantum Chromodynamics; Gluons

20040010367, Northern Illinois Univ., De Kalb, IL, USA

Summary Report of Working Group 4: Electron Beam Driven Concepts

Hogan, M. J.; Barov, N.; Apr. 2003; 14 pp.; In English

Report No.(s): DE2003-813002; SLAC-PUB-9707; No Copyright; Avail: Department of Energy Information Bridge

Although the title Electron Beam Driven Concepts can in principle cover a broad range of advanced accelerator schemes, in the context of this workshop and the various other working groups, working group 4 discussions centered primarily around the many active investigations of the electron or positron beam driven plasma wakefield accelerator. The past year has seen advances along three main fronts: experiment, simulation and theory. This paper will give a brief summary of the various talks presented to the group, summarize group discussions and conclude with a few comments on future directions.

NTIS

Electron Beams; Particle Accelerators

20040010370 Stanford Linear Accelerator Center, Stanford, CA, USA

DIRC for a Higher Luminosity B Factory

Hadig, T.; Oct. 2002; 22 pp.; In English

Report No.(s): DE2003-813009; SLAC-PUB-9715; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Mesons; Particle Collisions; Luminosity; Particle Beams

20040010371 Stanford Linear Accelerator Center, Stanford, CA, USA

New Measurement of $B D^* \text{Pion}$ Branching Fractions

2003; 16 pp.; In English

Report No.(s): DE2003-813065; SLAC-PUB-9763; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Polarization; Particle Decay; Branching (Physics)

20040010374 Stanford Linear Accelerator Center, Stanford, CA, USA

First Observation of $\tau 3(\pi)(\eta)(\nu \text{ sub } \tau)$ and $\tau f1 \pi \nu \text{ sub } \tau$ Decays

2003; 16 pp.; In English

Report No.(s): DE2003-813066; SLAC-PUB-9764; No Copyright; Avail: Department of Energy Information Bridge

The authors have observed new channels for Gamma decays with an n in the final state. We study 3-prong tau decays, using the n yields $\Gamma\Gamma$ and n yields 3π (sup 0) decay modes and 1-prong decays with two π (sup 0)'s using the n yields $\Gamma\Gamma$ channel.

NTIS

Particle Decay; Channels

20040010427

Application Framework and Data Model Prototype for the BaBar Experiment

Quarrie, D. R.; Porter, F. C.; Jul. 2003; 10 pp.; In English

Report No.(s): DE2003-813261; SLAC-PUB-9996; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

Particle Accelerators; Mesons

20040010482, State Univ. of New York, Stony Brook, NY, USA

Elementary Aharonov-Bohm System in Three Space Dimensions: Quantum Attraction with no Classical Force

Goldhaber, A. S.; Requist, R.; Dec. 2002; 18 pp.; In English

Report No.(s): DE2003-812603; SLAC-PUB-9606; No Copyright; Avail: Department of Energy Information Bridge

As a consequence of the Aharonov-Bohm effect, there is a quantum-induced attraction between a charged particle and a rigid impenetrable hoop made from an arbitrarily thin tube containing a superconductor quantum of magnetic flux. This is remarkable because in classical physics there is no force between the two objects, and quantum-mechanical effects (associated with uncertainty-principle energy) generally are repulsive rather than attractive. For an incident spinless charged particle in a P wave, in a configuration with total angular momentum zero, we verify a resonance just above threshold using the Kohn variational principle in its S-matrix form. Even if optimistic choices of parameters describing a model system with these properties turned out to be feasible, the temperature required to observe the resonance would be far lower than has yet been attained in the laboratory.

NTIS

Superconductors (Materials); Quantum Theory

20040010483 Princeton Univ., NJ, USA

SLAC Polarized Electron Source and Beam for E-158

Humensky, T. B.; Jan. 2003; 12 pp.; In English

Report No.(s): DE2003-812608; SLAC-PUB-9615; No Copyright; Avail: Department of Energy Information Bridge

SLAC E-158 is making the first measurement of parity violation in Moeller scattering. E-158 measures the right-left cross-section asymmetry, $A(\text{sub LR})$, in the scattering of a 45-GeV polarized electron beam off unpolarized electrons in a liquid hydrogen target. E-158 plans to measure the expected Standard Model asymmetry of (approx) $10(\text{sup } -7)$ to an accuracy of better than $10(\text{sup } -8)$. This paper discusses the performance of the SLAC polarized electron source and beam during E-158's first physics run in April/May 2002.

NTIS

Electron Beams; Linear Accelerators

20040010521, Hawaii Univ., Honolulu, HI, USA

Self-Energy of Improved Staggered Quarks

Becher, T.; Melnikov, K.; Feb. 2003; 10 pp.; In English

Report No.(s): DE2003-812639; SLAC-PUB-9652; No Copyright; Avail: Department of Energy Information Bridge

We calculate the fermion self-energy at $O(\alpha_s)$ for the Symanzik improved staggered fermion action used in recent lattice simulations by the MILC collaboration. We demonstrate that the algebraic approach to lattice perturbation theory, suggested by us recently, is a powerful tool also for improved lattice actions.

NTIS

Fermions; Quarks

20040010522 Fermi National Accelerator Lab., Batavia, IL, USA

Beam Collimation at Hadron Colliders

Mokhov, N. V.; Jul. 2003; 12 pp.; In English

Report No.(s): DE2003-812781; FERMILAB-CONF-03/220; No Copyright; Avail: Department of Energy Information Bridge

Operational and accidental beam losses in hadron colliders can have a serious impact on machine and detector performance, resulting in effects ranging from minor to catastrophic. Principles and realization are described for a reliable beam collimation system required to sustain favorable background conditions in the collider detectors, provide quench stability of superconducting magnets, minimize irradiation of accelerator equipment, maintain operational reliability over the life of the machine, and reduce the impact of radiation on personnel and the environment. Based on detailed Monte-Carlo simulations, such a system has been designed and incorporated in the Tevatron collider. Its performance, comparison to measurements and possible ways to further improve the collimation efficiency are described in detail. Specifics of the collimation systems designed for the SSC, LHC, VLHC, and HERA colliders are discussed.

NTIS

Collimators; Linear Accelerators

20040010530

Determination of the Michel Parameters and the tau Neutrino Helicity in tau Decay

2003; 22 pp.; In English

Report No.(s): DE2003-813081; SLAC-PUB-9780; No Copyright; Avail: Department of Energy Information Bridge

The most general, local, derivative-free, and lepton-number-conserving four fermion point interaction for leptonic tau decays yields in the helicity projection form the matrix element where $G(\text{sub } 1)$ parametrizes the total strength of the interaction.

NTIS

Neutrinos; Helices; Particle Decay

20040010624, California Univ., Irvine, CA, USA, Pennsylvania State Univ., University Park, PA, USA

Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture

Munger, C. T.; Mandelkern, M.; Schultz, J.; Armstrong, T. A.; Hasan, M. A.; 2003; 28 pp.; In English

Report No.(s): DE2003-813309; SLAC-PUB-10056; No Copyright; Avail: Department of Energy Information Bridge

The authors propose to detect the first antihydrogen atoms. The integrated luminosity expected in 1994 of $200 \text{ pb}(\text{sup } -1)$ for $(\bar{p}p)$ annihilation in the E760 hydrogen gas target will produce a sample of $10(\text{sup } 3)$ antihydrogen atoms. These atoms exit the accumulator in a low emittance, neutral beam which will be detected by an apparatus set up in the gap between the accumulator and debuncher rings. They believe the antihydrogen can be detected with essentially unit efficiency and zero background; the total cost of the project is roughly \$300 K. The proponents expect to share costs. They request only a few shifts of protons to make a hydrogen beam with which to calibrate their apparatus, but the experiment is otherwise wholly parasitic on E760 and needs no new beam time.

NTIS

Detection; Pair Production; Positrons; Antimatter; Hydrogen Atoms

20040010627

Maximum Acceptance Detector for the Fermilab Collider (MAX)

Gao, Y. T.; 2003; 24 pp.; In English

Report No.(s): DE2003-813318; SLAC-PUB-10066; No Copyright; Avail: Department of Energy Information Bridge

We propose a detector for the Collider which will cover the largest possible ranges of angles with electromagnetic calorimetry and charged tracking, and with hadronic calorimetry for the forward direction. The goal for the complete detector would be acceptance down to approx. 1 mrad, in contrast to CDF and DO, which have coverage only to approx, 40 mrad.

NTIS

Instruments; Particle Accelerators

20040010629 Stanford Linear Accelerator Center, Stanford, CA, USA

Study of Inclusive Semileptonic B Meson Decays with the BABAR Detector

Lueth, V. G.; Sep. 2002; 10 pp.; In English

Report No.(s): DE2003-813331; SLAC-PUB-9695; No Copyright; Avail: Department of Energy Information Bridge

This is a brief report on the measurement of the inclusive branching fraction $(\text{Beta})(\bar{B}) \rightarrow X(\text{sub } c)(\ell)(\text{sup } -)(\bar{\nu})$ and the preliminary measurement of the first moment of the hadron mass $M(\text{sub } X)$ in such decays. The implications of these results on $(\text{vertical bar})V(\text{sub } cb)(\text{vertical bar})$ are discussed.

NTIS

Mesons; Branching (Physics); Detectors; Particle Decay

20040012591 Stanford Linear Accelerator Center, Stanford, CA, USA

Search for Inclusive $b \rightarrow s l^+ l^-$

2003; 14 pp.; In English

Report No.(s): DE2003-813339; SLAC-PUB-9835; No Copyright; Avail: Department of Energy Information Bridge

We have searched for the effective FCNC decays $b \rightarrow s l^+ l^-$ using an inclusive method. We set upper limits on the branching ratios $(\text{Beta})(b \rightarrow s e^+ e^-) < 5.7 \times 10(\text{sup } -5)$, $(\text{Beta})(b \rightarrow s \mu^+ \mu^-) < 5.8 \times 10(\text{sup } -5)$, and $(\text{Beta})(b \rightarrow s e^+ \mu^-) < 2.2 \times 10(\text{sup } -5)$ (at 90% C. L.). Combining the di-electron and

di-muon decay modes we find $(\text{Beta}(b(\text{yields}) \text{sl}(\text{sup}+) \text{l}(\text{sup}-)) < 4.2 \times 10(\text{sup}-5) \text{ (at 90\% C.L.)}$.

NTIS

Quarks; Branching (Physics); Particle Decay

80

SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

20040012916 Coast Guard, Washington, DC

Navigation and Vessel Inspection Circular No. 8-01, Change 1. CH-1 to NVIC 8-01, Approval of Navigation Equipment for Ships

Nov. 20, 2003; 30 pp.; In English

Report No.(s): PB2004-102545; USCG-NVIC-8-01-CH-1; No Copyright; Avail: CASI; [A03](#), Hardcopy

This Circular revises Navigation and Vessel Inspection Circular (NVIC) No. 8-01 to amend the guidance provided for a Coast Guard approval program for navigation equipment, as required under Chapter V, Regulation 18, of the 2000 amendments to the 1974 International Convention for the Safety of Life at Sea (SOLAS). These changes are needed to clarify the approval process for manufacturers seeking Coast Guard approval. Additionally, it established a process for voyage data recorder service providers to obtain Coast Guard approval.

NTIS

Navigation Aids; Ships; Data Processing; Inspection

81

ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20040008910 Fulton-Montgomery Community Coll., Johnstown, NY, USA

Spatial Information Technology Center at Fulton-Montgomery Community College

Flinton, Michael E.; January 2004; 36 pp.; In English

Contract(s)/Grant(s): NAG13-00043; NAG13-02053; No Copyright; Avail: CASI; [A03](#), Hardcopy

The Spatial Information Technology Center (SITC) at Fulton-Montgomery Community College (FMCC) continued to fulfill its mission and charter by successfully completing its third year of operations under Congressional funding and NASA sponsorship. Third year operations (01 Oct 02 - 30 Sep 03) have been funded and conducted utilizing two authorized Research Grants NAG 13-00043 (via a one-year no-cost extension expiring Sep 03) and NAG 13-02053 (one-year no-cost extension expiring Sep 04). Drawdowns and reporting of fiscal activities for SITC operations continues to pass through the Institute for the Application of Geo-spatial Technology (IAGT) at Cayuga Community College in Auburn, New York. Fiscal activity of the Center is reported quarterly via SF 272 to IAGT, thus this report contains only a budgetary overview and forecast of future expenditures for the remaining funds of NAG 13 - 02053. Funds from NAG 13 - 00043 were exhausted during the fourth quarter of fiscal year FY02 - 03, which necessitated initial draw down of NAG 13 - 02053. The IAGT receives no compensation for administrative costs as authorized and approved by NASA in each award budget. This report also includes the necessary addendums for each NAG award, as required by federal guidelines, though no reportable activities took place within this report period. Attached are the signed Report of New Technology/Inventions and a Final Property Report identifying qualifying equipment purchased by the Center. As an academic, economic and workforce development oriented program, the Center has made significant strides in bringing the technology, knowledge and applications of the spatial information technology field to the region it serves. Through the mission of the Center, the region's educational, economic development and work force communities have become increasingly educated to the benefits of spatial (Geospatial) technology, particularly in the region's K-12 arena. SITC continues to positively affect the region's education, employment and economic development, while expanding its services and operations designed to be customer driven, growing infrastructure and affecting systemic change.

Derived from text

Communities; Economic Development; Forecasting; Information Systems; Technology Utilization

20040010862 NASA Ames Research Center, Moffett Field, CA, USA

Observations on SOFIA Observation Scheduling: Search and Inference in the Face of Discrete and Continuous Constraints

Frank, Jeremy; Gross, Michael; Kuerklu, Elif; October 19, 2003; 7 pp.; In English; 14th International Conference on Automated Planning and Scheduling, 8 Jun. 2004, Canada; Copyright; Avail: CASI; [A02](#), Hardcopy

We did cool stuff to reduce the number of IVPs and BVPs needed to schedule SOFIA by restricting the problem. The restriction costs us little in terms of the value of the flight plans we can build. The restriction allowed us to reformulate part of the search problem as a zero-finding problem. The result is a simplified planning model and significant savings in computation time.

Author

Sofia (Airborne Observatory); Schedules; Flight Plans

20040012627 NASA Ames Research Center, Moffett Field, CA, USA

A Comparison of Techniques for Scheduling Fleets of Earth-Observing Satellites

Globus, Al; Crawford, James; Lohn, Jason; Pryor, Anna; [2003]; 8 pp.; In English; 14th International Conference on Automated Planning and Scheduling, 3-7 Jun. 2004, Whistler, British Columbia, Canada

Contract(s)/Grant(s): AIST-0042; No Copyright; Avail: CASI; [A02](#), Hardcopy

Earth observing satellite (EOS) scheduling is a complex real-world domain representative of a broad class of over-subscription scheduling problems. Over-subscription problems are those where requests for a facility exceed its capacity. These problems arise in a wide variety of NASA and terrestrial domains and are .XI important class of scheduling problems because such facilities often represent large capital investments. We have run experiments comparing multiple variants of the genetic algorithm, hill climbing, simulated annealing, squeaky wheel optimization and iterated sampling on two variants of a realistically-sized model of the EOS scheduling problem. These are implemented as permutation-based methods; methods that search in the space of priority orderings of observation requests and evaluate each permutation by using it to drive a greedy scheduler. Simulated annealing performs best and random mutation operators outperform our squeaky (more intelligent) operator. Furthermore, taking smaller steps towards the end of the search improves performance.

Author

Scheduling; Earth Observations (From Space); Genetic Algorithms; Experimentation

20040012713 NASA Ames Research Center, Moffett Field, CA, USA

Scheduling in the Face of Uncertain Resource Consumption and Utility

Frank, Jeremy; Dearden, Richard; [2003]; 6 pp.; In English; 14th International Conference on Automated Planning and Scheduling, Jun. 2004, Vancouver, British Columbia, Canada; No Copyright; Avail: CASI; [A02](#), Hardcopy

We discuss the problem of scheduling tasks that consume uncertain amounts of a resource with known capacity and where the tasks have uncertain utility. In these circumstances, we would like to find schedules that exceed a lower bound on the expected utility when executed. We show that the problems are NP- complete, and present some results that characterize the behavior of some simple heuristics over a variety of problem classes.

Author

Scheduling; Heuristic Methods

20040012872 Argonne National Lab., IL

Canister Transfer System Event Sequence Calculation

2001; 36 pp.; In English

Report No.(s): DE2003-790349; CAL-CTS-SE-000001-REV 00; No Copyright; Avail: Department of Energy Information Bridge

The Department of Energy Spent Nuclear Fuel Canister, Transportation, and Monitored Geologic Repository Systems, Structures, and Components Performance Allocation Study (CRWMS M&O 2000b) allocated performance to both the canisters received at the Monitored Geologic Repository (MGR) and the MGR Canister Transfer System (CTS). The purpose of this calculation is to evaluate an assumed range of canister and CTS performance allocation failure probabilities and determine the effect of these failure probabilities on the frequency of a radionuclide release. Five canister types are addressed in this calculation; high-level radioactive waste (HLW) canisters containing vitrified borosilicate glass, HLW canisters containing immobilized plutonium surrounded by borosilicate glass (Pu/HLW canisters), Department of Energy (DOE) spent

nuclear fuel (DSNF) standard canisters (4 sizes), DSNF multi-canister overpacks (MCOs) for N-reactor fuel and other selected DSNF, and naval spent nuclear fuel (SNF) canisters (2 sizes).

NTIS

Computation; Cans; Transportation; Radioactive Wastes; Waste Treatment; Maintenance

82

DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20040008931 Nippon Telegraph and Telephone Public Corp., Musashino, Japan

Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions

Kitagawa, Yukako; Tamaki, Motonori; NTT Technical Review, Volume 1, No. 7; October 2003, pp. 73-78; In English; See also 20040008922; Original contains black and white illustrations; Copyright; Avail: Other Sources

In call centers, responding quickly and accurately to inquiries from customers regarding services and problems is important from the perspective of customer satisfaction. NTT Cyber Solutions Laboratories is developing a highly accurate system for retrieving similar cases using two-word linked expressions. The goal of the system is to effectively utilize cases from past inquiries.

Author

Information Retrieval; Algorithms

20040010329 Maryland Univ. Baltimore County, Catonsville, MD, USA

Architectural Design for the Global Legal Information Network

Kalpakis, Konstantinos; [1999]; 61 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-069-60; No Copyright; Avail: CASI; [A04](#), Hardcopy

In this report, we provide a summary of our activities regarding the goals, requirements analysis, design, and prototype implementation for the Global Legal Information Network, a joint effort between the Law Library of Congress and NASA.

Author

Architecture (Computers); Legal Liability; Information Management; General Overviews

20040010369

U.S. LCI Database Project-Phase I Final Report

Aug. 2003; 52 pp.; In English

Report No.(s): DE2003-15004558; No Copyright; Avail: Department of Energy Information Bridge

Table of Contents: Introduction; Phase I process; Guideline development; Recommended work program for Phase II; Data dissemination; Appendix A: List of Advisory Group Members; Appendix B: Prioritized products and materials list and Appendix C: Possible Transformation Processes for Database.

NTIS

Data Bases; Life Cycle Costs; Life (Durability)

20040010372 Office of Naval Research, Arlington, VA

Science and Technology Text Mining: Hypersonic and Supersonic Flow

Kostoff, Ronald N.; Eberhart, Henry J.; Toothman, Darrell R.; Nov. 17, 2003; 47 pp.; In English

Report No.(s): AD-A418717; No Copyright; Avail: CASI; [A03](#), Hardcopy

Database Tomography (DT) is a textual database analysis system consisting of two major components: 1) algorithms for extracting multi-word phrase frequencies and phrase proximities (physical closeness of the multi-word technical phrases) from any type of large textual database, to augment 2) interpretative capabilities of the expert human analyst. DT was used to derive technical intelligence from a hypersonic/ supersonic flow (HSF) database derived from the Science Citation Index and the Engineering Compendex. Phrase frequency analysis by the technical domain expert provided the pervasive technical themes of the HSF database, and the phrase proximity analysis provided the relationships among the pervasive technical themes. Bibliometric analysis of the HSF literature supplemented the DT results with author/ journal/ institution publication and citation data. Comparisons of HSF results with past analyses of similarly structured near-earth space and Chemistry databases

are made. One important finding is that many of the normalized bibliometric distribution functions are extremely consistent across these diverse technical domains.

DTIC

Data Bases; Information Retrieval; Supersonic Flow; Hypersonic Flow

20040010458 Utah Univ., Salt Lake City, UT, USA

Automated Data Collection, Analysis, and Archival

Martin, P. T.; Wu, P.; Nov. 2003; 106 pp.; In English

Report No.(s): PB2004-101513; No Copyright; Avail: CASI; [A06](#), Hardcopy

Traffic Monitoring Stations (TMS) are a component of the ATMS. TMS collect traffic volumes, speed and density from the Interstate system. These devices are located each one-half mile, on each lane, of the interstate system in the Salt Lake Valley. Presently the Utah Department of Transportation does not collect or store this information. Traffic operations, pavement management, traffic and safety and the planning divisions require this information. This report investigates data collection, analysis and archival. The first task identified the needs of all potential internal and external users. Literature searches were employed to identify methods used in other states. A prototype database was developed to verify that data was collected and was retrievable in a useful format.

NTIS

Data Acquisition; Data Bases; Traffic; Velocity

20040010471 Economics and Statistics Administration, Washington, DC, USA

Digital Economy, 2003

Dec. 2003; 128 pp.; In English

Report No.(s): PB2004-102360; No Copyright; Avail: CASI; [A07](#), Hardcopy

Digital Economy 2003 (DE2003) is the Department's fifth annual report on conditions in U.S information technology (IT) industries and the effects of IT on national economic performance. Each of these reports has addressed questions that economists have sometimes found difficult to answer. Early nineteenth-century economists earned a reputation as practitioners of the 'dismal science' by underestimating the ability of technological innovation to drive faster than expected economic growth. This year, the basic analytic challenge has been complicated by an atypical recovery. Productivity growth has been remarkably strong, output growth has gathered impressive momentum, and prices remain low. But employment has lagged. This report examines IT's role in these unusual developments.

NTIS

Commerce; Economic Analysis; Internets; On-Line Systems; Electronic Commerce

20040010650 Naval Postgraduate School, Monterey, CA

An Analysis of Implementation Issues for the Searchable Content Object Reference Model (SCORM) in Navy Education and Training

Anderson, Randy L.; Granado, Joseph L.; Sep. 2003; 127 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418525; No Copyright; Avail: CASI; [A07](#), Hardcopy

The thesis research examines the emergence of Sharable Content Object Reference Model (SCORM) architecture currently under development by the Advanced Distributed Learning (ADL) initiative established by the Department of Defense (DoD). SCORM is a collection of specifications adapted from multiple sources to provide a comprehensive suite of E- Learning capabilities that enable interoperability, accessibility, and reusability of Web-based learning content. To understand better the implementation issues of SCORM architecture, the authors analyze all versions of SCORM to understand the evolution of this emerging architecture. It contrasts the evolving requirements for shareable content objects with concerns of copyright issues. The authors address development and implementation issues surrounding the maturation of SCORM architecture and the ADL initiative. The authors recommend that DoD, international, and civilian business partners join in improving B-Learning by embracing technology, such as SCORM, that allows for shareable content objects to be used and reused within civilian and military education and training Learning Management Systems (LMS) across the World Wide Web.

DTIC

Management Systems; Navy; Learning

20040010746 Army War Coll., Carlisle Barracks, PA, USA

Post-Conflict Reconstruction. A Selected Bibliography

Nov. 2003; 35 pp.; In English

Report No.(s): AD-A419056; No Copyright; Avail: CASI; [A03](#), Hardcopy

This document is a report of the Post-Conflict Reconstruction, a Selected Bibliography.

DTIC

Bibliographies; Information Dissemination

20040010769 Office of Naval Research, Arlington, VA

Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems

Kostoff, Ronald N.; Rio, J. A. del; Garcia, Esther O.; Ramirez, Ana M.; Humenik, James A.; Jan. 2003; 43 pp.; In English

Report No.(s): AD-A418862; No Copyright; Avail: CASI; [A03](#), Hardcopy

Research sponsors, evaluators, managers, and performers have strong motivations in insuring that their research products reach the intended audience. Further, it is important to understand the infrastructure characteristics of the specific audience reached (names, organizations, countries). Because of the many direct and indirect pathways through which fundamental research can impact applications, identifying the user audience and the research impacts can be very complex and time consuming.

DTIC

Data Transmission; Systems Management; Technologies; Texts; Research and Development

20040010846 Air Force Research Lab., Wright-Patterson AFB, OH

Compilation of Technical Papers Published Under Work Unit 72312501 (71844501) 'Acceleration Performance in Advanced Operational Systems,' 1985-2000

Albery, William B.; Jan. 2001; 34 pp.; In English

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A419158; AFRL-HE-WP-TR-2002-0229; No Copyright; Avail: CASI; [A03](#), Hardcopy

This report contains a listing of technical papers, reports, oral presentations, book chapters, abstracts, proceedings papers, and journal articles developed by the engineers and scientists at the Dynamic Environment Simulator centrifuge, in the Biodynamics and Acceleration Branch (AFRL/HEPA), from 1985-2000. The papers are listed by first author and chronologically under ten different categories: Sustained acceleration, human performance, biodynamics models, physiology, robotics, supermaneuverable and agile flight, adaptive controls and force reflection, situational awareness/spatial disorientation, helmet mounted Systems, and miscellaneous topics.

DTIC

Conferences; Biodynamics; Robotics; Human Performance

20040012579 Connecticut Univ., Storrs, CT

Verification and Validation of Embedded Knowledge- Based Software Systems

Santos, Eugene, Jr; Jan. 1999; 5 pp.; In English

Contract(s)/Grant(s): F49620-99-1-0059

Report No.(s): AD-A419001; AFRL-SR-AR-TR-03-0483; No Copyright; Avail: CASI; [A01](#), Hardcopy

Our overall goal in this research effort has been to reduce the time and cost of constructing embedded knowledge based systems that must handle uncertainty in information in a rigorous manner. Our fundamental approach actively assists subject-matter experts in organizing their knowledge inclusive of uncertainty to build such embedded systems in a consistent and correct as well as effective fashion. We pursued this by carefully examining the nature of uncertainty and information semantics and developing intelligent tools for verification and validation that provides assistance to the subject-matter expert in constructing their knowledge based systems. We have developed a prototype environment for constructing Bayesian Knowledge Bases called PESKI.

DTIC

Program Verification (Computers); Embedding; Knowledge Based Systems

20040012583 Loyola Univ. Chicago, Maywood, IL, USA

Prostate Cancer in Nigerians, Jamaicans and U.S. Blacks

Freeman, Vincent L.; Mar. 2003; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0029

Report No.(s): AD-A419191; No Copyright; Avail: CASI; [A03](#), Hardcopy

The purpose of this research is to develop the infrastructure for comparative studies of prostate cancer among blacks who reside in contrasting environmental settings, West Africa, the Caribbean and the USA. This effort addresses six areas: case recruitment, case characterization, tissue collection and storage, integrated database development, targeted laboratory expertise and pilot research. Key Research Accomplishments-Year 3: 1) Established a research infrastructure that supports unified measurement of exposure and prostate cancer disease in Chicago, Illinois and Kingston, Jamaica; 2) Completed molecular in over 40% of subjects enrolled; 3) Created a computerized database linking demographical, clinical and pathological characteristics of each case to archived tissue specimens and results of nutritional and genetic measurements; 4) Completed statistical comparisons of i) demographical, clinical and pathological characteristics of cases from Chicago, Kingston and West Africa; ii) levels of antioxidants and fatty acids in serum and prostate tissue in cases diagnosed in Chicago and Jamaica; iii) and have performed association studies between variants of genes involved in androgen metabolism and clinical stage of prostate cancer within and across cases from Chicago, Jamaica and West Africa; 6) Our first manuscript was accepted to the journal *The Prostate* and initial findings from our pilot studies have been presented at national meetings. The remainder of the no-cost extension will be used to complete and submit manuscripts and research grant proposals based on our work thus far.

DTIC

Cancer; Jamaica; Prostate Gland; United States; Ethnic Factors; Africa

20040012603 NASA Marshall Space Flight Center, Huntsville, AL, USA

A Step Beyond Simple Keyword Searches: Services Enabled by a Full Content Digital Journal Archive

Boccippio, Dennis J.; [2003]; 1 pp.; In English; Fall American Geophysical Union Conference, 8-12 Dec. 2003, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The problems of managing and searching large archives of scientific journal articles can potentially be addressed through data mining and statistical techniques matured primarily for quantitative scientific data analysis. A journal paper could be represented by a multivariate descriptor, e.g., the occurrence counts of a number key technical terms or phrases (keywords), perhaps derived from a controlled vocabulary (e.g., the American Meteorological Society's Glossary of Meteorology) or bootstrapped from the journal archive itself. With this technique, conventional statistical classification tools can be leveraged to address challenges faced by both scientists and professional societies in knowledge management. For example, cluster analyses can be used to find bundles of 'most-related' papers, and address the issue of journal bifurcation (when is a new journal necessary, and what topics should it encompass). Similarly, neural networks can be trained to predict the optimal journal (within a society's collection) in which a newly submitted paper should be published. Comparable techniques could enable very powerful end-user tools for journal searches, all premised on the view of a paper as a data point in a multidimensional descriptor space, e.g.: 'find papers most similar to the one I am reading', 'build a personalized subscription service, based on the content of the papers I am interested in, rather than preselected keywords', 'find suitable reviewers, based on the content of their own published works', etc. Such services may represent the next 'quantum leap' beyond the rudimentary search interfaces currently provided to end-users, as well as a compelling value-added component needed to bridge the print-to-digital-medium gap, and help stabilize professional societies' revenue stream during the print-to-digital transition.

Author

Information Retrieval; Data Retrieval

20040012645 NASA Ames Research Center, Moffett Field, CA, USA

Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets

Fretter, E. F., Editor; Kuhns, Jay, Editor; Nuez, Jay, Editor; October 2003; 16 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The Ames Arc Jet Complex has a rich heritage of over 40 years in Thermal Protection System (TPS) development for every NASA Space Transportation and Planetary program, including Apollo, Space Shuttle, Viking, Pioneer-Venus, Galileo, Mars Pathfinder, Stardust, NASP, X-33, X-34, SHARP-B1 and B2, X-37 and Mars Exploration Rovers. With this early TPS history came a long heritage in the development of the arc jet facilities. These are used to simulate the aerodynamic heating that occurs on the nose cap, wing leading edges and on other areas of the spacecraft requiring thermal protection. TPS samples have been run in the arc jets from a few minutes to over an hour, from one exposure to multiple exposures of the same sample, in order to understand the TPS materials response to a hot gas flow environment (representative of real hyperthermal environments experienced in flight). The Ames Arc Jet Complex is a key enabler for customers involved in the three major areas of TPS development: selection, validation, and qualification. The arc jet data are critical for validating TPS thermal

models, heat shield designs and repairs, and ultimately for flight qualification.

Derived from text

Research Facilities; Thermal Protection; Temperature Distribution; Roving Vehicles; Mechanical Properties; High Temperature Gases; Aerodynamic Heating

20040012667 NASA Ames Research Center, Moffett Field, CA, USA

An On-line Technology Information System (OTIS) for Advanced Life Support

Levri, Julie A.; Boulanger, Richard; Hogan, John A.; Rodriguez, Luis; [2003]; 2 pp.; In English; Habitation 2004, 4-7 Jan. 2004, Orlando, FL, USA

Contract(s)/Grant(s): 131-20-10-26; Copyright; Avail: Other Sources; Abstract Only

OTIS is an on-line communication platform designed for smooth flow of technology information between advanced life support (ALS) technology developers, researchers, system analysts, and managers. With pathways for efficient transfer of information, several improvements in the ALS Program will result. With OTIS, it will be possible to provide programmatic information for technology developers and researchers, technical information for analysts, and managerial decision support. OTIS is a platform that enables the effective research, development, and delivery of complex systems for life support. An electronic data collection form has been developed for the solid waste element, drafted by the Solid Waste Working Group. Forms for other elements (air revitalization, water recovery, food processing, biomass production and thermal control) will also be developed, based on lessons learned from the development of the solid waste form. All forms will be developed by consultation with other working groups, comprised of experts in the area of interest. Forms will be converted to an on-line data collection interface that technology developers will use to transfer information into OTIS. Funded technology developers will log in to OTIS annually to complete the element-specific forms for their technology. The type and amount of information requested expands as the technology readiness level (TRL) increases. The completed forms will feed into a regularly updated and maintained database that will store technology information and allow for database searching. To ensure confidentiality of proprietary information, security permissions will be customized for each user. Principal investigators of a project will be able to designate certain data as proprietary and only technical monitors of a task, ALS Management, and the principal investigator will have the ability to view this information. The typical OTIS user will be able to read all non-proprietary information about all projects. Interaction with the database will occur over encrypted connections, and data will be stored on the server in an encrypted form. Implementation of OTIS will initiate a community-accessible repository of technology development information. With OTIS, ALS element leads and managers will be able to carry out informed technology selection for programmatic decisions. OTIS will also allow analysts to make accurate evaluations of technology options. Additionally, the range and specificity of information solicited will help educate technology developers of program needs. With augmentation, OTIS reporting is capable of replacing the current fiscal year-end reporting process. Overall, the system will enable more informed R&TD decisions and more rapid attainment of ALS Program goals.

Author

Information Systems; Life Support Systems; On-Line Systems; Technology Assessment

20040012852 Maryland Univ. Baltimore County, Catonsville, MD, USA

Center of Excellence in Space Data and Information Sciences

Yesha, Yelena; [1999]; 189 pp.; In English; No Copyright; Avail: CASI; A09, Hardcopy

This report summarizes the range of computer science-related activities undertaken by CESDIS for NASA in the twelve months from July 1, 1998 through June 30, 1999. These activities address issues related to accessing, processing, and analyzing data from space observing systems through collaborative efforts with university, industry, and NASA space and Earth scientists. The sections of this report which follow, detail the activities undertaken by the members of each of the CESDIS branches. This includes contributions from university faculty members and graduate students as well as CESDIS employees. Phone numbers and e-mail addresses appear in Appendix F (CESDIS Personnel and Associates) to facilitate interactions and new collaborations.

Author

Research Facilities; Aerospace Systems; Information Management; Computer Networks; Data Management

20040012853 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Center of Excellence in Space Data and Information Sciences

[1998]; 198 pp.; In English; No Copyright; Avail: CASI; A09, Hardcopy

This report summarizes the range of computer science-related activities undertaken by CESDIS for NASA in the twelve

months from July 1, 1997 through June 30, 1998. These activities address issues related to accessing, processing, and analyzing data from space observing systems through collaborative efforts with university, industry, and NASA space and Earth scientists. The sections of this report which follow, detail the activities undertaken by the members of each of the CESDIS branches. This includes contributions from university faculty members and graduate students as well as CESDIS employees. Phone numbers and e-mail addresses appear in Appendix E (CESDIS Personnel and Associates) to facilitate interactions and new collaborations.

Author

Research Facilities; Earth Observations (From Space); Data Management; Information Management; Earth Sciences

20040012854 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Center of Excellence in Space Data and Information Sciences

[1997]; 333 pp.; In English; No Copyright; Avail: CASI; [A15](#), Hardcopy

This report summarizes the range of computer science-related activities undertaken by CESDIS for NASA in the twelve months from July 1, 1996 through June 30, 1997. These activities address issues related to accessing, processing, and analyzing data from space observing systems through collaborative efforts with university, industry, and NASA space and Earth scientists. The sections of this report which follow, detail the activities undertaken by the members of each of the CESDIS branches. This includes contributions from university faculty members and graduate students as well as CESDIS employees. Phone numbers and e-mail addresses appear in Appendix D (CESDIS Personnel and Associates) to facilitate interactions and new collaborations.

Author

Computer Networks; Data Processing; Data Acquisition; Earth Observations (From Space)

85

TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety*, *16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20040010869 Battelle Columbus Labs., OH, USA

Technical Report and Testing Protocol for Commercial Microbiological Amendment Testing and Evaluation

Dec. 1995; 198 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418951; No Copyright; Avail: CASI; [A09](#), Hardcopy

Microbiological degradation of various pollutants has been studied intensively within the past 15 years. It was established early on in laboratory studies that petroleum hydrocarbon compounds are particularly susceptible to microbial degradation. The Air Force has identified more than 1,300 JP-4 jet fuel spill sites under the Installation Restoration Program. The majority of these sites have high levels of fuel absorbed or occluded in the soils. When a fuel spill occurs, a major portion of the fuel is adsorbed to the soil matrix. The fuel then slowly releases water-soluble compounds, such as benzene, into the groundwater. Given the large number of areas contaminated with petroleum hydrocarbons, bioremediation would appear to be a promising cost-effective and efficient technology to use at these sites. Commercial microbial amendments typically are promoted for use at these sites, when often indigenous microorganisms are present and are capable of degrading the contaminants.

DTIC

Water Pollution; Waste Treatment; Petroleum Products

88

SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20040008900 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Laboratory for Terrestrial Physics

March 2003; 179 pp.; In English; Original contains color illustrations

Report No.(s): NASA/NP-2003-5-550-GSFC; No Copyright; Avail: CASI; [A09](#), Hardcopy

The Laboratory for Terrestrial Physics is dedicated to the advancement of knowledge in Earth and planetary science, by conducting innovative research using space technology. The Laboratory's mission and activities support the work and new initiatives at NASA's Goddard Space Flight Center (GSFC). The Laboratory's success contributes to the Earth Science Directorate as a national resource for studies of Earth from Space. The Laboratory is part of the Earth Science Directorate based at the GSFC in Greenbelt, MD. The Directorate itself is comprised of the Global Change Data Center (GCDC), the Space Data and Computing Division (SDCD), and four science Laboratories, including Laboratory for Terrestrial Physics, Laboratory for Atmospheres, and Laboratory for Hydrospheric Processes all in Greenbelt, MD. The fourth research organization, Goddard Institute for Space Studies (GISS), is in New York, NY. Relevant to NASA's Strategic Plan, the Laboratory ensures that all work undertaken and completed is within the vision of GSFC. The philosophy of the Laboratory is to balance the completion of near term goals, while building on the Laboratory's achievements as a foundation for the scientific challenges in the future.

Derived from text

Planetary Systems; Earth Sciences; Aerospace Sciences; NASA Programs; Aerospace Engineering

20040010584 Lunar and Planetary Inst., Houston, TX, USA

Europa and Titan: Oceans in the Outer Solar System?

Kiefer, Walter S.; Space Science Reference Guide, 2nd Edition; [2003]; 6 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Biologists believe that life requires the presence of some sort of liquid to serve as a medium for the chemical reactions needed to sustain life. On Earth, liquid water plays this role. Water has some chemical properties that make it particularly favorable as a medium for life, although we probably should not rule out the possibility that other types of liquid, such as organic liquids, might play this role in other types of biology. If liquids truly are necessary for life, then the potential abodes for life in the outer Solar System are quite limited. Europa and Titan both have been proposed to have oceans and are therefore the best possible candidate locations for life in the outer Solar System.

Author

Solar System; Titan; Europa; Extraterrestrial Oceans; Chemical Reactions

20040010596 Hawaii Univ., HI, USA

Damage by Impact: The Case at Meteor Crater, Arizona

Martel, Linda M. V.; Space Science Reference Guide, 2nd Edition; [2003]; 8 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

50,000 years ago mammoths, sloths, bison, and camels likely roamed the grassy rolling hills and woodlands of the Colorado Plateau in an area known today as northeastern Arizona. But in an instant, a meteorite impact disturbed this peaceful scene. What were the environmental effects? What happened to the animals living near the impact? According to David Kring of the University of Arizona, damage would have been swift and extensive. Casualties resulted from vaporization, burial by the ejected bedrock, and from the destructive air blast moving across the landscape. Kring calculated the magnitude and radial extent of the air blast produced by the Meteor Crater impact event using scaling relationships from nuclear explosions. His estimates show immediate vaporization of plants and animals at ground zero. Winds in excess of 1000 km/hour scoured the land within 3 to 5 km of the point of impact and led to swift devastation of the local population of plants and animals. Just how often does this sort of impact event occur on Earth? We'll examine the potential hazards.

Author

Meteorite Craters; Damage; Point Impact; Meteorite Collisions; Environment Effects

20040010597 Rice Univ., Houston, TX, USA

Space Weather: The Invisible Foe

Freeman, John W., Jr.; Space Science Reference Guide, 2nd Edition; [2003]; 6 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The scene is a darkened spacecraft operations control room. Across one wall are TV monitors displaying live pictures. The first monitor carries the Winter Olympics ski jump competition. The others across the same row display a BBC drama, a weather channel, and a Spanish language commentator. Only the sound from the Olympics monitor can be heard. The panel

behind a long console desk has more monitors, this time containing charts and graphs with technical data on the status of seven satellites. The night-shift operations crew is gathered around the Olympics monitor. Twenty-two thousand miles above the Earth, a giant communications satellite orbits with its antennas pointed toward Europe. Suddenly, a small jet of gas squirts out from a miniature rocket thruster on the side of the spacecraft. Unlike the usual satellite orientation adjustment bursts, which last only a few seconds, this time the attitude control thruster does not shut off. The satellite begins to tumble, slowly at first, then more rapidly. Back in the satellite control room, all four TV monitors go blank and a warning beep is heard from the spacecraft status monitors. An ALERT warning indicator announces that spacecraft S-5 attitude control sensors report an out-of-limits condition followed by a loss-of-signal indication from the main transmitter. 'Oh-oh! Phantom commands again!' shouts someone as the operations crew scrambles to return to their stations. They prepare to send new commands to the out-of-control spacecraft. Several control console phones begin to ring almost simultaneously. 'Prepare to reroute the four video transponders from S-5 to S-7 on my mark,' says the lead controller into his headset. 'We'll lose the extreme eastern part of our antenna footprint. We've got no other choice!' The phones are ignored.

Author

Ground Based Control; Communication Satellites; Spacecraft Control; Weather

20040012955 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A 10 Kelvin Magnet for Space-Flight ADRs

Tuttle, James; Pourrahimi, Shahin; Shirron, Peter; Canavan, Edgar; DiPirro, Michael; Riall, Sara; [2003]; 14 pp.; In English; 2003 Space Cryogenics Workshop, 18 Sep. 2003, Girdwood, AK, USA; Copyright; Avail: CASI; [A03](#), Hardcopy

Future NASA missions will include detectors cooled by adiabatic demagnetization refrigerators (ADR) coupled with mechanical cryocoolers. A lightweight, low-current 10 Kelvin magnet would allow the interface between these devices to be at temperatures as high as 10 Kelvin, adding flexibility to the instrument design. We report on the testing of a standard-technology Nb₃Sn magnet and the development of a lightweight, low-current 10 Kelvin magnet. We also discuss the outlook for flying a 10 Kelvin magnet as part of an ADR system.

Author

Low Currents; Adiabatic Demagnetization Cooling; Cryogenic Cooling

20040012995 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Three-Gorge Reservoir: A 'Controlled Experiment' for Calibration/Validation of Time-Variable Gravity Signals Detected from Space

Chao, Benjamin F.; Boy, J. P.; [2003]; 1 pp.; In English; International Conference of GIS and Remote Sensing in Hydrology, Water Resources and Environment, 16-19 Sep. 2003, YiChang,, China; No Copyright; Avail: Other Sources; Abstract Only

With the advances of measurements, modern space geodesy has become a new type of remote sensing for the Earth dynamics, especially for mass transports in the geophysical fluids on large spatial scales. A case in point is the space gravity mission GRACE (Gravity Recovery And Climate Experiment) which has been in orbit collecting gravity data since early 2002. The data promise to be able to detect changes of water mass equivalent to sub-cm thickness on spatial scale of several hundred km every month or so. China's Three-Gorge Reservoir has already started the process of water impoundment in phases. By 2009, 40 km³ of water will be stored behind one of the world's highest dams and spanning a section of middle Yangtze River about 600 km in length. For the GRACE observations, the Three-Gorge Reservoir would represent a geophysical controlled experiment, one that offers a unique opportunity to do detailed geophysical studies. -- Assuming a complete documentation of the water level and history of the water impoundment process and aided with a continual monitoring of the lithospheric loading response (such as in area gravity and deformation), one has at hand basically a classical forward-inverse modeling problem of surface loading, where the input and certain output are known. The invisible portion of the impounded water, i.e. underground storage, poses either added values as an observable or a complication as an unknown to be modeled. Wang (2000) has studied the possible loading effects on a local scale; we here aim for larger spatial scales upwards from several hundred km, with emphasis on the time-variable gravity signals that can be detected by GRACE and follow-on missions. Results using the Green's function approach on the PREM elastic Earth model indicate the geoid height variations reaching several millimeters on wavelengths of about a thousand kilometers. The corresponding vertical deformations have amplitude of a few centimeters. In terms of long-wavelength spherical harmonics, the induced geoid height variations are very close to the accuracy of GRACE-recoverable gravity field, while the low-degree (2 to 5) harmonics should be detectable. With a large regional time-variable gravity signal, the Three-Gorge experiment can serve as a useful calibration/verification for GRACE (including the elastic loading effects), and future gravity missions (especially for visco-elastic yielding as well as underground water variations).

Author

Calibrating; Time Signals; Gravitational Fields; Data Acquisition

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20040008664 Mission Research Corp., Nashua, NH

Validation Report for the Celestial Background Scene Descriptor (CBSD) stellar Point Sources Model CBSKY4

Noah, Paul V.; Noah, Meg; Feb. 2001; 197 pp.; In English

Contract(s)/Grant(s): F19628-93-C-0028; Proj-S321

Report No.(s): AD-A418711; AFRL-VS-TR-2001-1579; No Copyright; Avail: CASI; [A09](#), Hardcopy

This report provides detailed information on the evolving improvements and verification of the AFRL/HRS Celestial Background Scene Descriptor (CBSD) Stellar Point Sources code (CBSKY4). The CBSKY4 model produces infrared signatures of point sources, most of which are part of our galaxy. CBSKY4 is currently in use by the MDA as a component of the SSGM simulation package and as part of the AFRL PLEXUS R3V2 atmospheric effects modelling suite.

DTIC

Probing; Astronomy; Galaxies

20040008858 Boston Univ., Boston, MA, USA

AstroNet: A Tool Set for Simultaneous, Multi-Site Observations of Astronomical Objects

Chakrabarti, Supriya; January 05, 1995; 8 pp.; In English

Contract(s)/Grant(s): NAS5-32337; USRA-5555-13; No Copyright; Avail: CASI; [A02](#), Hardcopy

Earth-based, fully automatic 'robotic' telescopes have been in routine operation for a number of years. As their number grows and their distribution becomes global, increasing attention is being given to forming networks of various sorts that will allow them, as a group, to make observations 24 hours a day in both hemispheres. We have suggested that telescopes based in space be part of this network. We further suggested that any telescope on this network be capable of asking, almost in real time, that other robotic telescopes perform support observations for them. When a target of opportunity required support observations, the system would determine which telescope(s) in the network would be most appropriate to make the observations and formulate a request to do so. Because the network would be comprised of telescopes located in widely distributed regions, this system would guarantee continuity of observations. This report summarizes our efforts under this contract. We proposed to develop a set of data collection and display tools to aid simultaneous observation of astronomical targets from a number of observing sites. We planned to demonstrate the usefulness of this toolset for simultaneous multi-site observation of astronomical targets. Possible candidates for the proposed demonstration included the Extreme Ultraviolet Explorer (EUVE), International Ultraviolet Explorer (IUE), and ALEXIS, sounding rocket experiments. Ground-based observatories operated by the University of California, Berkeley, the Jet Propulsion Laboratory, and Fairborn Observatory in Mesa, Arizona were to be used to demonstrate the proposed concept. Although the demonstration was to have involved astronomical investigations, the tools were to have been applicable to a large number of scientific disciplines. The software tools and systems developed as a result of the work were to have been made available to the scientific community.

Author

Telescopes; Observation; Spaceborne Astronomy; Software Development Tools

20040008885 NASA Ames Research Center, Moffett Field, CA, USA

Electrical Charging of the Clouds of Titan

Borucki, William J.; Whitten, R. C.; Bakes, E. L. O.; [2003]; 1 pp.; In English; AGU 2003 Fall Meeting, 8-12 Dec. 2003, San Francisco, CA, USA

Contract(s)/Grant(s): 344-37-00-03; Copyright; Avail: Other Sources; Abstract Only

We have used recent data on graphitic cloud particles in the atmosphere of Titan to compute the electrical charging of the particles (radii ranging from 0.01 microns to 0.26 microns). The charging on the nightside was rather similar to that obtained earlier (Borucki et al, Icarus, 72, 604-622, 1987) except that charge distributions on the particles are now computed and recently obtained cloud particle sizes and density distributions were employed. The negative charge on particles of 0.26 microns peaked at 9 at 150 km altitude. The computations were repeated for the dayside with the addition of photoelectron emission by the particles as a result of the absorption of solar UV radiation. Particles (except the very smallest) now became positively charged with particles of radius 0.26 microns being charged up to +47. Next, very small particles (radii approximately 3×10^{-4} microns) of polycyclic aromatic hydrocarbons (PAHs) were introduced and treated as sources of negative ions since they could be either neutral or carry one negative charge. Moreover, they are mobile so that they had to

be treated like molecular size negative ions although much more massive. They had the effect of substantially reducing the electron densities in the altitude range 190 to 310 km to values less than the negative PAH densities and increasing the peak electron charge on the larger particles. Particles of radius 0.26 microns bore peak charges of plus or minus 47 at altitudes of approximately 250 km. The simulated effect of PAHs on the nightside proved to be much less pronounced; at the peak negative PAH density, it was less than the electron density. The physics governing these results will be discussed.

Author

Titan; Electric Charge; Graphite; Molecular Clouds; Charged Particles

20040010331 Smithsonian Astrophysical Observatory, Cambridge, MA, USA

High Resolution Imaging of Circumstellar Disks at Millimeter Wavelengths

Wilner, David J.; December 2003; 5 pp.; In English

Contract(s)/Grant(s): NAG5-11777; No Copyright; Avail: CASI; [A01](#), Hardcopy

We update progress on our research program to use high angular resolution imaging of thermal dust continuum emission at millimeter and submillimeter wavelengths to probe the structure of protoplanetary disks and debris disks around nearby stars. Observations at these wavelengths are advantageous because the dust emission is generally optically thin and directly proportional to mass, contrast with stellar photospheres is not problematic, and the wavelength dependence provides information on an important regime of grain sizes. We employ several facilities for state-of-the-art high resolution observations, including the Very Large Array (VLA), the Australia Telescope Compact Array (ATCA), the Plateau de Bure Interferometer (PdBI) of the Institut de RadioAstronomie Millimetrique, the Submillimeter Array (SMA) of the Smithsonian Astrophysical Observatory, and the Caltech Submillimeter Observatory (CSO). Many recent highlights of our program were presented in an invited review on High Angular Resolution Studies of Disks- the Millimetre at IAU Symposium 221, Star Formation at High Angular Resolution, in July 2003.

Derived from text

Debris; Protoplanetary Disks; Stellar Envelopes

20040010559 Hawaii Univ., Honolulu, HI, USA

Mercury Unveiled

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 9 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mercury, the second smallest planet and the closest one to the Sun, may appear to some as a drab, colorless, heavily-cratered world. Not so. New analysis of data returned by the Mariner 10 mission in 1974 and 1975 reveals a surface with lava flows and deposits from explosive volcanic eruptions, variations in composition across its surface and into its crust, and a different chemical composition from the other inner planets. These discoveries were made by Mark Robinson at the USA Geological Survey in Flagstaff, Arizona (he is now at Northwestern University) and Paul Lucey of the University of Hawaii. Using improvements in computer and image-processing technologies, and a better understanding of how light reflects off planetary surfaces than was available in the mid-1970s, Robinson and Lucey manipulated the original data and produced a color image of Mercury that depicts compositional differences across its stark surface.

Author

Mercury (Planet); Chemical Composition; Craters; Planetary Surfaces; Crusts

20040010563 Hawaii Univ., HI, USA

New Data, New Ideas, and Lively Debate about Mercury

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 15 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mercury is an important planet. It is closest to the Sun, so its chemical composition helps us test ideas for how the planets formed. In contrast to Venus and Mars, Mercury is generating a magnetic field today--useful in understanding Earth's magnetic field. It has a huge metallic core compared to the other rocky planets. Its cratered, lunar-like surface records a fascinating geologic history. A hundred scientists attended a conference about this important little planet. It was held at the Field Museum in Chicago, Illinois, and was sponsored by the Museum, the Lunar and Planetary Institute, and the National Aeronautics and Space Administration. Mariner 10, the only space mission to Mercury, flew by it three times in 1974 and 1975. Reworking the data in light of a better understanding of remote sensing and using new image analysis techniques is leading to amazing

new insights about the planet's origin and geological evolution. And although we have had only one mission to the planet, there are a growing number of astronomical observations from Earth to study the tenuous and complicated mercurian atmosphere. Radar observations are providing dramatic new views of the surface and have revealed mysterious deposits (probably of water ice) in the polar regions. New ideas about Mercury's formation, geologic history, interior processes, magnetic field, and atmosphere will be tested by two missions that will examine the planet in detail.

Author

Mercury (Planet); Chemical Composition; Craters; Geomagnetism; Magnetic Fields

20040010564 Hawaii Univ., HI, USA

Origin of the Earth and Moon

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 7 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

About 130 scientists met December 1-3, 1998, in Monterey, California, to share ideas about the formation and very early history of the Earth and Moon. Conference organizers constructed the program to allow time for participants to discuss crucial issues, leading to lively and spirited debate. The giant impact hypothesis for the Moon's origin still holds center stage. This idea suggests that the Moon formed as the result of a colossal impact onto the accumulating Earth, heating it and flinging the raw ingredients for the Moon into orbit around the Earth. The giant impact hypothesis is consistent with our ideas for how planets were assembled and explains some important features of the Earth-Moon system, such as why the Moon has only a tiny metallic core. The isotopes of several elements in Earth and Moon rocks all point to the process of planet formation taking 50 to 100 million years. Planet formation involved many huge impacts, implying a molten (or mostly molten) primitive Earth. There are good indications that the young Earth was almost completely molten when it formed, but conference participants enthusiastically debated the extent of melting and the lines of evidence used to deduce it. Fortunately, there is an intense effort underway to understand the processes that might have operated inside the Earth during its birth, so the chemical evidence for or against the giant impact hypothesis may one day be acquired.

Author

Planetary Evolution; Earth-Moon System; Earth (Planet)

20040010583 Audentes Publishing Co., USA

The Sun

Miller, Patrick; Keating, Christopher; Sidhwa, Anahita; Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Sun, of course, is just a nearby star. By studying the Sun, we are able to learn things that apply to other, far-off stars. And by studying far-off stars, we can learn things about our own star. Our star, the Sun, is a middle-aged star approximately 5 billion years old. Theoretical models from astrophysics predict that it will live another 5 billion years before it depletes its thermonuclear fuel of hydrogen. At this point it will evolve into a red giant, engulfing the current orbits of the terrestrial planets, although the enlarged size of the Sun will cause the planets to move into more distant orbits, probably allowing Earth and Mars to avoid being engulfed. For a star, the Sun is average in size and mass. Its diameter is 1.4×10^6 km (1,400,000 km) and its mass is 2×10^{33} g. Its average density is 1.4 g/cu cm, which is about the same as the jovian planets. However, the density at the core is about 150 g/cu cm, 20 times the density of iron. As a result, 90% of Sun's mass is within the inner 50% of radius. Compared to Earth, the Sun is enormous. The Earth's diameter is a meager 13,000 kilometers and its mass is 6×10^{27} g. This makes the Sun's diameter 100 times the Earth's diameter and its mass is 300,000 times that of the Earth. The Sun is large enough to fit one million Earths inside it. But compared to the red giant star Antares, the Sun is a dwarf. The super red giant Antares has a diameter of 5.1 AU, which would put its outer edge between the planets of Mars and Jupiter if it were at the center of the solar system like the Sun is.

Derived from text

Sun; Hydrogen; Terrestrial Planets; Gas Giant Planets; Red Giant Stars

20040010594 Audentes Publishing Co., USA

The Optical Telescope

Miller, Patrick; Keating, Christopher; Sidhwa, Anahita; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The telescope can be defined as a 'light bucket' with the function of gathering as many photons as possible from a given region of the sky and directing them to a focal point. Today, we have many kinds of telescopes so that we can view the sky in many different wavelengths of the electromagnetic spectrum. But the first telescopes, and the most common, are optical telescopes, which collect light in the visible region. The discovery of the telescope was first announced by Hans Lippershey, a Dutch optician, in 1608 when he filed for a patent. Galileo then became the first to use one to perform astronomical observations in late 1609, or early 1610. One of the first things he discovered was that the Moon was not perfect -- there were mountains and craters on its surface. He also found that there were spots on the face of the Sun and Venus went through phases like the Moon. He discovered the first four moons of Jupiter -- today known as the Galilean moons. All of these were very dramatic contradictions to Aristotle's geocentric, perfect universe and strongly supported the heliocentric universe of Copernicus. Thus, the age of the telescope began, and immediately began changing our understanding of the universe. These early telescopes used a lens that would bend the rays of light to a focal point. Telescopes of this kind are called refracting telescopes. Though they provided a tremendous advance over the bare eye, they also had problems; among these was the problem of making lenses with great accuracy. Also, there was the problem of color fringes along the edges of objects, known as chromatic aberration (chroma means color). This was due to the fact that glass bends light, but it bends different colors at different angles, thus making a small rainbow. A solution to this problem was found in 1757 by using two lenses. The second lens is made of a slightly different kind of glass and would then cancel out the chromatic aberration of the first. But now, the light is passing through two lenses and is being absorbed by both. Since glass absorbs certain wavelengths, this makes these telescopes much less useful at those wavelengths.

Author

Telescopes; Electromagnetic Spectra; Refracting Telescopes; Photons

20040010611 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Baby Stars in Orion Solve Solar System Mystery

Wanek, Christopher; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

What do X-rays, meteoroids, infant stars in the Orion Nebula, and our solar system have in common? Perhaps much more than anyone thought. Eric Feigelson of Penn State University stumbled onto a connection one day while his thoughts were far from the solar system, turned toward the vibrant neighborhood of young stars, hot gas, and caliginous dust of the Orion Nebula. This nebula, 1500 light-years away, is visible to the naked eye in the constellation Orion, a gem to behold with a good pair of binoculars or a telescope under dark skies. In Orion, Feigelson inadvertently found a possible solution to a long-standing mystery about our own solar system: the presence of exotic isotopes locked away in meteoroids. Scientists have assumed that these short-lived isotopes - special forms of atomic nuclei, such as aluminum-26 and calcium-41 - were transported here by a nearby supernova. Only tenuous evidence for such an explosion exists, but what else could have made the isotopes? The isotopes are about as old as the solar system, and the Sun couldn't possibly have been powerful enough to create them. Well, maybe we need to give the Sun a little more credit. Feigelson found that very young, mid-sized stars in the Orion Nebula - in the same stellar class as our Sun except they are only a million years old - produce powerful flares visible in X-rays. His team spotted these X-ray flares with the Chandra X-Ray Observatory. These baby-tantrum flares are indeed energetic enough to forge heavy isotopes, Feigelson says. If the infant stars in Orion can do it now, then our Sun could have done the same when the solar system was forming about 4.5 billion years ago, when the Sun itself was only a few million years old.

Derived from text

Orion Nebula; Solar System; Star Formation; Isotopes; Meteoritic Composition; X Ray Astronomy

20040010612 Audentes Publishing Co., USA

The Center of the Galaxy

Miller, Patrick; Keating, Christopher; Sidhwa, Anahita; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For centuries it was believed that the Earth was the center of the universe. This belief, known as the geocentric model, held that the Earth was stationary while the sky revolved above it on a set of celestial spheres. Aristotle eloquently argued how the Earth must be stationary and thus the center of the universe because: 1) You could not feel the Earth move; 2) There was no wind due to a moving Earth, hence it must be stationary; 3) The birds and the clouds would be left behind if the Earth were moving; and 4) If the Earth were moving the stars would display a parallax effect. This was to be the common belief for over

1800 years, not only because of the persuasive arguments of Aristotle, but also because a feature of the Greek philosophy was that the universe was perfect. It was not until the twentieth century that it was finally established that neither we nor our galaxy formed the center of the universe.

Derived from text

Astronomy; Histories; Milky Way Galaxy; Universe; Space Observations (From Earth); Cosmology; Galactic Structure

20040010816 NASA Marshall Space Flight Center, Huntsville, AL, USA

The EUSO Mission

Adams, J. H.; [2003]; 1 pp.; In English; Second International Conference on Particle and Fundamental Physics in Space, 10-12 Dec. 2003, Washington, DC, USA; No Copyright; Avail: Other Sources; Abstract Only

The Extreme Universe Space Observatory (EUSO) experiment will use the Earth's atmosphere viewed from space as a detector of extreme energy cosmic rays (EECRs). EUSO's collecting power will exceed previous experiments by more than a factor of 10, making it possible to extend the cosmic ray spectrum beyond 100 EeV with high statistics. This will make it possible to investigate in detail the spectrum beyond the point where the Greisen-Zatsepin-Kuzmin effect is expected to strongly attenuate the proton flux and even beyond the energy where cosmic ray nuclei should be photo-disintegrated by interactions with the universal microwave background. EUSO makes its measurements by detecting the extensive air showers (EASs) that result from the interactions of the EECRs. Looking down from its birth on the International Space Station through wide-angle optics, EUSO records a high-speed movie clip of passage of each EAS through the atmosphere with the light from nitrogen fluorescence and Cherenkov light reflected from the EAS landing point. These movie clips are analyzed to determine the EECR arrival direction and energy. The data also allow neutrino-induced EASs to be discriminated from nuclear-induced showers.

Author

Earth Atmosphere; Observatories; Cosmic Rays; Spaceborne Experiments; Space Missions

20040012584 Air Force Research Lab., Hanscom AFB, MA

The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide

Egan, M. P.; Mizuno, D. R.; Engelke, C. W.; Price, S. D.; Carey, S. J.; Cohen, M.; Kraemer, K. E.; Wright, C. O.; Gugliotti, G. M.; Oct. 2003; 91 pp.; In English

Contract(s)/Grant(s): Proj-1182

Report No.(s): AD-A418993; AFRL-VS-TR-2003-1589; AFRL-VS-TR-2003-1589; No Copyright; Avail: CASI; [A05](#), Hardcopy

This Explanatory Guide describes Version 2.3 of the Midcourse Space Experiment (MSX) Point Source Catalog. The data calibration and processing are detailed, with particular attention to improvements over the initial published catalog, Version 1.2. The current catalog contains sources extracted from nearly all of the MSX astronomy experiments, including more than 100,000 sources that were not in the previous version. Most of the photometry was extracted from the co-added images, as opposed to the single-scan data, which significantly improves the signal-to-noise ratio of the point sources and hence their reliability. Comparison with Tycho-2 positions indicates that the astrometric accuracy of Version 2.3 is better by about 1 compared to Version 1.2. In addition to the Galactic Plane, Areas Missed by IRAS, and the Large Magellanic Cloud, which were included in Version 1.2, this release includes data from the Small Magellanic Cloud, eight nearby galaxies, and several molecular clouds and star forming regions.

DTIC

Astronomy; Photometry

20040012623 State Univ. of New York, NY, USA

The Stability of Orbital Configurations and the Ultimate Configurations of Planetary and Satellite Systems

Lissauer, Jack J.; Duncan, Martin J.; [2004]; 6 pp.; In English

Contract(s)/Grant(s): NAG5-9680; SUNY-1011102-1-011103; No Copyright; Avail: CASI; [A02](#), Hardcopy

The contents include the following: 1) Dynamical Evolution of the Earth-Moon Progenitors. 2) Dynamical Connections between Giant and Terrestrial Planets. 3) Dynamics of the Upsilon Andromedae Planetary System. 4) Dynamics of the Planets Orbiting GJ 876. and 5) Integrators for Planetary Accretion in Binaries.

Derived from text

Gas Giant Planets; Planets; Stability; Terrestrial Planets

20040012674 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Probing the Inflow/Outflow and Accretion Disk of Cygnus X-1 in the High State with the Chandra High Energy Transmission Grating

Feng, Y. X.; Tennant, A. F.; Zhang, S. N.; Astrophysical Journal; November 10, 2003; Volume 597, pp. 1017-1022; In English Contract(s)/Grant(s): NAS8-39073; GO2-3061X; DD2-3018X; NCC8-0200; NAG5-7927; NAG5-8523; Copyright; Avail: CASI; A02, Hardcopy

Cygnus X-1 was observed in the high state at the conjunction orbital phase (0) with Chandra High Energy Transmission Grating (HETG). Strong and asymmetric absorption lines of highly ionized species were detected, such as Fe xxv, Fe xxiv, Fe xxiii, Si xiv, S xvi, Ne x, etc. In the high state the profile of the absorption lines is composed of an extended red wing and a less extended blue wing. The red wings of higher ionized species are more extended than those of lower ionized species. The detection of these lines provides a way to probe the properties of the flow around the companion and the black hole in Cyg X-1 during the high state. A broad emission feature around 6.5 keV was significantly detected from the spectra of both the Chandra/HETG and the RXTE/Proportional Counter Array. This feature appears to be symmetric and can be fitted with a Gaussian function rather than the Laor disk line model of the fluorescent Fe K(alpha) line from an accretion disk. The implications of these results on the structure of the accretion flow of Cyg X-1 in the high state are discussed.

Author

Accretion Disks; Asymmetry; Black Holes (Astronomy); Cygnus Constellation

20040012770 NASA Ames Research Center, Moffett Field, CA, USA

Spectral Models of Kuiper Belt Objects and Centaurs

Cruikshank, Dale; Ore, Christina M. Dalle; September 29, 20003; 14 pp.; In English Contract(s)/Grant(s): RTOP 344-32-20-01

Report No.(s): RTOP 344-32-20-01; No Copyright; Avail: CASI; A03, Hardcopy

We present models of the spectral reflectances of groups of outer Solar System objects defined primarily by their colors in the spectral region 0.4 -1.2 microns, and which have geometric albedo 0.04 at wavelength 0.55 microns. Our models of the groups with the strongest reflectance gradients (reddest colors) use combinations of organic tholins. We test the hypothesis that metal-reddened igneous rock-forming minerals contribute to the red colors of Centaurs and KBOs by using the space-weathered lunar soil as one of the components of our models. We find that our models can admit the presence of moderate amounts of space-weathered (metal-reddened) minerals, but that they do not require this material to achieve the red colors of the reddest outer Solar System bodies. Our models with organic tholins are consistent with the results of other investigators.

Author

Kuiper Belt; Solar System; Spectral Bands; Spectral Reflectance; Mathematical Models; Asteroids

20040012798 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Empirical Decomposition of Near-IR Emission into Galactic and Extragalactic Components

Dwek, Eli; Arendt, Richard G.; [2002]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

We decompose the COBE/DIRBE observations of the near-IR sky brightness (minus zodiacal light) into Galactic stellar and interstellar medium (ISM) components and an extragalactic background. This empirical procedure allows us to estimate the 4.9 micron cosmic infrared background (CIB) as a function of the CIB intensity at shorter wavelengths. A weak indication of a rising CIB intensity at wavelengths greater than 3.5 microns hints at interesting astrophysics in the CIB spectrum, or warns that the foreground zodiacal emission may be incompletely subtracted. Subtraction of only the stellar component from the zodiacal-light-subtracted all-sky map reveals the clearest 3.5 micron ISM emission map, which is found to be tightly correlated with the ISM emission at far-IR wavelengths.

Author

Cosmic Background Explorer Satellite; Near Infrared Radiation; Galactic Evolution; Decomposition; Interstellar Matter

20040012804 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Town Hall Meeting Presentation

Mather, John C.; [2002]; 1 pp.; In English; American Astronomical Society Meeting, 7 Jan. 2003, Seattle, WA, USA; No Copyright; Avail: Other Sources; Abstract Only

The James Webb Space Telescope (JWST), formerly known as the Next Generation Space Telescope (NGST), will be the successor to the Hubble Space Telescope. It will carry 3 instruments to a deep space orbit around the Sun-Earth Lagrange point

L2, and will cover the wavelength range from 0.6 to 28 microns. The design concepts and current status of the project will be summarized, including the telescope and observatory contract proposed by the new prime contractor, TRW.

Author

James Webb Space Telescope; Spaceborne Telescopes; Observatories; Orbital Mechanics

20040012817 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Emission Line Galaxies in the STIS Parallel Survey, 1, Observations and Data Analysis

Teplitz, Harry I.; Collins, Nicholas R.; Gardner, Jonathan P.; Hill, Robert S.; Heap, Sara R.; Lindler, Don J.; Rhodes, Jason; Woodgate, Bruce E.; [2002]; 1 pp.; In English

Contract(s)/Grant(s): NAS5-26555; Copyright; Avail: Other Sources; Abstract Only

In the first three years of operation STIS obtained slitless spectra of approximately 2500 fields in parallel to prime HST observations as part of the STIS Parallel Survey (SPS). The archive contains approximately 300 fields at high galactic latitude (l greater than 30) with spectroscopic exposure times greater than 3000 seconds. This sample contains 220 fields (excluding special regions and requiring a consistent grating angle) observed between 6 June 1997 and 21 September 2000, with a total survey area of approximately 160 square arcminutes. At this depth, the SPS detects an average of one emission line galaxy per three fields. We present the analysis of these data, and the identification of 131 low to intermediate redshift galaxies detected by optical emission lines. The sample contains 78 objects with emission lines that we infer to be redshifted [OII] λ 3727 emission at $0.43 < z < 1.7$. The comoving number density of these objects is comparable to that of H α -emitting galaxies in the NICMOS parallel observations. One quasar and three probable Seyfert galaxies are detected. Many of the emission-line objects show morphologies suggestive of mergers or interactions. The reduced data are available upon request from the authors.

Author

Emission Spectra; Seyfert Galaxies; Cosmology; Galactic Evolution

20040012965 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Supernovae and the Accelerating Universe

Wood, H. John; [2003]; 2 pp.; In English; Astronomy with Hubble Space Telescope; No Copyright; Avail: CASI; [A01](#), Hardcopy

Orbiting high above the turbulence of the earth's atmosphere, the Hubble Space Telescope (HST) has provided breathtaking views of astronomical objects never before seen in such detail. The steady diffraction-limited images allow this medium-size telescope to reach faint galaxies of 30th stellar magnitude. Some of these galaxies are seen as early as 2 billion years after the Big Bang in a 15 billion year old universe. Up until recently, astronomers assumed that all of the laws of physics and astronomy applied back then as they do today. Now, using the discovery that certain supernovae are standard candles, astronomers have found that the universe is expanding faster today than it was back then: the universe is accelerating in its expansion.

Derived from text

Astronomy; Supernovae; Universe; Acceleration (Physics)

90

ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20040008854 Stanford Linear Accelerator Center, Stanford, CA, USA, Perimeter Inst. for Theoretical Physics, Waterloo, Ontario, Canada, Canterbury Univ., Christchurch, New Zealand

Geometrization of Matter Proposal in the Barrett-Crane Model and Resolution of Cosmological Problems

Alexander, S.; Crane, L.; Sheppeard, M.; 2003; 14 pp.; In English

Report No.(s): DE2003-813313; SLAC-PUB-10061; No Copyright; Avail: Department of Energy Information Bridge

We give an overview of the current issues in early universe cosmology and consider the potential resolution of these issues in an as yet nascent spin foam cosmology. The model is the Barrett-Crane model for quantum gravity along with a generalization of manifold complexes to complexes including conical singularities.

NTIS

Cosmology; Models

20040008860 Iowa Univ., Iowa City, IA, USA

Polar Plasma Wave Investigation Data Analysis in the Extended Mission

Gurnett, Donald A.; Menietti, J. D.; [2003]; 7 pp.; In English

Contract(s)/Grant(s): NAG5-11942; No Copyright; Avail: CASI; [A02](#), Hardcopy

The low latitude boundary layer (LLBL) is a region where solar wind momentum and energy is transferred to the magnetosphere. Enhanced 'broadband' electric plasma waves from less than 5 Hz to 10(exp 5) Hz and magnetic waves from less than 5 Hz to the electron cyclotron frequency are characteristic of the LLBL. Analyses of Polar plasma waves show that these 'broadband' waves are actually discrete electrostatic and electromagnetic modes as well as solitary bipolar pulses (electron holes). It is noted that all wave modes can be generated by approx. 100 eV to approx. 10 keV auroral electrons and protons. We will review wave-particle interactions, with focus on cross-diffusion rates and the contributions of such interactions toward the formation of the boundary layer. In summary, we will present a scenario where the global solar wind-magnetosphere interaction is responsible for the auroral zone particle beams, and hence for the generation of plasma waves and the formation of the boundary layer. It is speculated that all planetary magnetospheres will have boundary layers and they will be characterized by similar currents and plasma wave modes.

Derived from text

Plasma Waves; Wave-Particle Interactions; Boundary Layers; Solar Wind

20040008869 Purkyne Univ., Brno, Czechoslovakia, Sternberg Astronomical Inst., Moscow, USSR, Adam Mickiewicz Univ., Poznan, Poland

Variability of Accretion Flow in the Core of the Seyfert Galaxy NGC 4151

Czerny, B.; Doroshenko, V. T.; Nikolajuk, M.; Schwarzenberg-Czerny, A.; Loska, Z.; Jul. 2003; In English

Report No.(s): DE2003-813323; No Copyright; Avail: National Technical Information Service (NTIS)

We analyze observations of the Seyfert galaxy NGC 4151 covering 90 years in the optical band and 27 years in the 2 - 10 keV X-ray band. We compute the Normalized Power Spectrum Density (NPSD), the Structure Function (SF) and the Autocorrelation Function (ACF) for these data. The results show that the optical and X-ray variability properties are significantly different. X-ray variations are predominantly in the timescale range of 5 - 1000 days. The optical variations have also a short timescale component which may be related to X-ray variability but the dominant effect is the long timescale variability, with timescales longer than 10 years. We compare our results with observations of NGC 5548 and Cyg X-1. We conclude that the long timescale variability may be caused by radiation pressure instability in the accretion disk, although the observed timescale in NGC 4151 is by a factor of few longer than expected. X-ray variability of this source is very similar to what is observed in Cyg X-1 but scaled with the mass of the black hole, which suggests that the radiation pressure instability does not affect considerably the X-ray production.

NTIS

Seyfert Galaxies; Accretion Disks

20040008878, Udine Univ., Italy

Use of HepRep in GLAST

Perl, J.; Giannitrapani, R.; Frailis, M.; Jul. 2003; In English

Report No.(s): DE2003-813347; SLAC-PUB-9908; No Copyright; Avail: National Technical Information Service (NTIS)

HepRep is a generic, hierarchical format for description of graphics representables that can be augmented by physics information and relational properties. It was developed for high energy physics event display applications and is especially suited to client/server or component frameworks. The GLAST experiment, an international effort led by NASA for a gamma-ray telescope to launch in 2006, chose HepRep to provide a flexible, extensible and maintainable framework for their event display without tying their users to any one graphics application. This paper describes why GLAST selected HepRep and how they went about implementing a HepRep-based event display in their GAUDI framework.

NTIS

Gamma Ray Telescopes; High Energy Interactions

20040008884 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Formation of Primitive Bodies in the Protoplanetary Nebula

Cuzzi, Jeffrey N.; [2003]; 1 pp.; In English; Geochemistry/Cosmochemistry Seminar, 13-14 Nov. 2003, Chicago, IL, USA

Contract(s)/Grant(s): RTOP 344-37-22-03; No Copyright; Avail: Other Sources; Abstract Only

We have developed a simple model of global transport of solids in the protoplanetary nebula, including radial drift of large

particles and diffusion of small ones. The model has been applied to the formation and redistribution of the Ca-Al rich refractory mineral inclusions (CAIs) found in primitive chondrites. These objects form at much higher temperatures, and appear to be 1-3 million years older than, the dominant (chondrule) components found in the same parent bodies. A widespread concern has been the retention of CAIs for this long against gas-drag-induced radial drift into the sun. We show that outward radial diffusion in a weakly turbulent nebula can overwhelm inward drift, and prevent significant numbers of CAI-size particles from being lost into the sun for times on the order of several Myr. An element of this model is rapid inward radial drift of boulder-sized primitive (carbon-rich) silicate material, more like Halley-dust than CI chondrites in the early days of the nebula. This process can enrich the abundance of silicate and carbon material in the inner nebula, and may provide possible explanations for both chemical and isotopic properties of CAIs. The predicted enhancement of CO relative to water might be of relevance to recent IR astronomical observations of CO in the inner disks of several actively accreting T Tauri stars. This process has applications to the transport and redistribution of volatiles in general. Depending on the rubble particle size distribution, rapid radial drift of boulder-sized solids can bring more material inwards across a condensation front, to evaporate, than can subsequently be removed by nebula advection or diffusion, until a strong local enhancement is produced which allows diffusive loss to balance the drifting source. Application of this process to enhancement of the abundance of water near the 'ice line' will be discussed. Supported by the Origins of Solar Systems program.

Author

Protoplanets; Nebulae

20040008890 Smithsonian Astrophysical Observatory, Cambridge, MA, USA

Development and Operations of the Astrophysics Data System

Murray, Stephen S.; Oliverson, Ronald, Technical Monitor; December 2003; 35 pp.; In English

Contract(s)/Grant(s): NCC5-528

Report No.(s): Rept-3; No Copyright; Avail: CASI; [A03](#), Hardcopy

The ADS was represented at the AAS meeting with 3 poster papers and a demonstration booth. We have setup a mirror site of the VizieR data base system at the CDS. functionality of the ADC at Goddard. This will replace the Preparations for the APS and LPSC meetings in March started. We will have demonstrations at both meetings. Preparations for the APS and LPSC meetings in March continued. We will have demonstrations at both meetings. The ADS was represented with a poster at the joint AGUEGU meeting in Nice, France. Discussions about the on-going collaboration between the ADS and the CDS in Strasbourg, France were held in Strasbourg. The ADS was invited to organize a session about the ADS and its mirror sites at the next United Nations Workshop on Basic Space Sciences in the Developing World. Efforts are under way to enter the tables of contents of all conference proceedings in the SAO library into the ADS. This requires copying the tables of contents from all volumes in the library and have them typed in. This will greatly enhance the coverage of the literature in the ADS. We started the development of a search system for the full text of all scanned material in the ADS. This will eventually allow our users search capabilities that so far do not exist in any form. In order to enable the full text searching, we have purchased OCR software and are in the process of OCRing the scanned pages in the ADS. Efforts are in progress to handle the inclusion of data set identifiers in article manuscripts. The ADS will be the central system that will allow the journals to verify data set identifiers. The 'master verifier' has been implemented in prototype form at the ADS. We started to include more journals in Geosciences/Geophysics in the ADS. The Royal astronomical Society has decided to archive their on-line journals in the ADS three years after publication. We have started to process these older on-line articles in order to archive them in the ADS. Our mirror site in Korea now has a full article mirror. We developed XML output capability in the ADS. This will make it easier to exchange data with other data systems. We started the development of new indexing software that will eventually reduce the indexing time for a database from days to hours or less. The ADS was represented at the IAU General Assembly with a poster. Discussions with the IAU management were held about extending the ADS IAU collaborations.

Derived from text

Astrophysics; Data Systems; Information Retrieval; Computer Programming

20040010416

Supersymmetric Rotating Black Holes and Attractors

Kallos, R.; Rajaraman, A.; Kai Wong, W.; 2003; 12 pp.; In English

Report No.(s): DE2003-813126; SLAC-PUB-9841; No Copyright; Avail: Department of Energy Information Bridge

Five-dimensional stringy rotating black holes are embedded into $N=2$ supergravity interacting with one vector multiplet. The existence of an unbroken supersymmetry of the rotating solution is proved directly by solving the Killing spinor equations. The asymptotic enhancement of supersymmetry near the horizon in the presence of rotation is established via the calculation of the super-curvature. The area of the horizon of the rotating supersymmetric black holes is found to be $pZ3$ fix

- J_2 , where Z_{fix} is the extremal value of the central charge in moduli space.

NTIS

Supergravity; Supersymmetry; Black Holes (Astronomy)

20040010417

STU Black Holes and String Triality

Behrndt, K.; Kallosh, R.; Rahmfeld, J.; Shmakova, M.; Wong, W. K.; 2003; 16 pp.; In English

Report No.(s): DE2003-813135; SLAC-PUB-9856; No Copyright; Avail: Department of Energy Information Bridge

We found double-extreme black holes associated with the special geometry of the Calabi-Yau moduli space with the pre-potential $F = STU$. The area formula is STU -moduli independent and has $(SL(2, Z))^3$ symmetry in space of charges. The dual version of this theory without pre-potential treats the dilaton S asymmetric versus T, U -moduli. We display the dual relation between new (STU) black holes and stringy (S/TU) black holes using particular $Sp(8, Z)$ transformation. The area formula of one theory equals the area formula of the dual theory when expressed in terms of dual charges. We analyze the relation between (STU) black holes to string triality of black holes: (S/TU), (T/US), (U/ST) solutions. In democratic STU -symmetric version we find that all three S and T and U duality symmetries are non-perturbative and mix electric and magnetic charges.

NTIS

Symmetry; Black Holes (Astronomy); String Theory

20040010418

Counting Schwarzschild and Charged Black Holes

Halyo, E.; Kol, B.; Rajaraman, A.; Susskind, L.; Sep. 1996; 18 pp.; In English

Report No.(s): DE2003-813142; SLAC-PUB-9864; No Copyright; Avail: Department of Energy Information Bridge

We review the arguments that fundamental string states are in one to one correspondence with black hole states. We demonstrate the power of the assumption by showing that it implies that the statistical entropy of a wide class of non-extreme black holes occurring in string theory is proportional to the horizon area. However, the numerical coefficient relating the area and entropy only agrees with the Bekenstein-Hawking formula if the central charge of the string is six which does not correspond to any known string theory. Unlike the current D-brane methods the method used in this paper is applicable for the case of Schwarzschild and highly non-extreme charged black holes.

NTIS

String Theory; Black Holes (Astronomy)

20040010503 Princeton Univ., NJ

Flux Rope Acceleration and Enhanced Magnetic Reconnection Rate

Cheng, C. Z.; Ren, Y.; Choe, G. S.; Moon, Y. -J.; Mar. 2003; In English

Report No.(s): DE2003-813604; PPPL-3799; No Copyright; Avail: National Technical Information Service (NTIS)

A physical mechanism of flares, in particular for the flare rise phase, has emerged from our 2-1/2-dimensional resistive MHD simulations. The dynamical evolution of current-sheet formation and magnetic reconnection and flux-rope acceleration subject to continuous, slow increase of magnetic shear in the arcade are studied by employing a non-uniform anomalous resistivity in the reconnecting current sheet under gravity. The simulation results directly relate the flux rope's accelerated rising motion with an enhanced magnetic reconnection rate and thus an enhanced reconnection electric field in the current sheet during the flare rise phase. The simulation results provide good quantitative agreements with observations of the acceleration of flux rope, which manifests in the form of SXR ejecta or erupting filament or CMEs, in the low corona. Moreover, for the X-class flare events studied in this paper the peak reconnection electric field is about $O(10^{10} \text{ V/m})$ or larger, enough to accelerate particles to over 100 keV in a field-aligned distance of 10 km. Nonthermal electrons thus generated can produce hard X-rays, consistent with impulsive HXR emission observed during the flare rise phase.

NTIS

Solar Flares; Magnetic Field Reconnection

20040010568 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Gamma-Ray Burst Next Door

Wanek, Christopher; Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

I hesitate to spawn a thousand bad sci-fi flicks, but here it goes: Scientists now say that some gamma-ray bursts, the most powerful explosions in the universe, originate in nearby galaxy clusters. If one were to occur nearby, it could wipe out life on Earth. Fortunately, the chances of mass extinction are slimmer than the Chicago Cubs meeting the Boston Red Sox in the World Series (. . . and the Red Sox winning). But a new analysis of over 1400 archived gamma-ray bursts reveals that about 100 bursts originated within 325 million light-years of Earth, and not billions of light-years away as previously thought. If so, there's no reason why a burst couldn't go off in our galaxy.

Author

Gamma Ray Bursts; Gamma Ray Astronomy; Distance

20040010571 Audentes Publishing Co., USA

Kepler's Laws of Planetary Motion

Miller, Patrick; Keating, Christopher; Sidhwa, Anahita; Space Science Reference Guide, 2nd Edition; [2003]; 4 pp.; In English; See also 20040010556; Original contains black and white illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Are the planets in random motion around the Sun or is there some pattern to their movement? What is the exact shape of a planet's orbit around the Sun? Do all planets travel at the same speed? How long does it take Mars to make one revolution around the Sun and how does that time compare to Saturn's revolutionary period? Astronomers struggled to answer these questions for centuries and by the seventeenth century there was much data collected for the exact planetary positions of the then-known planets -- Mercury, Venus, Mars, Jupiter, and Saturn. The work of Johannes Kepler was a major landmark in the struggle to answer these questions, and by 1619 it was possible to predict the exact position of a planet using the three laws that bear Kepler's name.

Author

Kepler Laws; Histories; Planetary Orbits

20040010575 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Fun Times with Cosmic Rays

Wanjek, Christopher; Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Who would have thought cosmic rays could be so hip? Although discovered 90 years ago on death-defying manned balloon flights hip even by twenty-first-century extremesport standards cosmic rays quickly lost popularity as way-cool telescopes were finding way-too-cool phenomena across the electromagnetic spectrum. Yet cosmic rays are back in vogue, boasting their own set of superlatives. Scientists are tracking them down with new resolve from the Arctic to Antarctica and even on the high western plains of Argentina. Theorists, too, now see cosmic rays as harbingers of funky physics. Cosmic rays are atomic and subatomic particles - the fastest moving bits of matter in the universe and the only sample of matter we have from outside the solar system (with the exception of interstellar dust grains). Lower-energy cosmic rays come from the Sun. Mid-energy particles come from stellar explosions - either spewed directly from the star like shrapnel, or perhaps accelerated to nearly the speed of light by shock waves. The highest-energy cosmic rays, whose unequivocal existence remains one of astronomy's greatest mysteries, clock in at a staggering 10^{19} to 10^{22} electron volts. This is the energy carried in a baseball pitch; seeing as how there are as many atomic particles in a baseball as there are baseballs in the Moon, that's one powerful toss. No simple stellar explosion could produce them. At a recent conference in Albuquerque, scientists presented the first observational evidence of a possible origin for the highest-energy variety. A team led by Elihu Boldt at NASA's Goddard Space Flight Center found that five of these very rare cosmic rays (there are only a few dozen confirmed events) come from the direction of four 'retired' quasar host galaxies just above the arm of the Big Dipper, all visible with backyard telescopes: NGC 3610, NGC 3613, NGC 4589, and NGC 5322. These galaxies are billions of years past their glory days as the brightest beacons in the universe. Yet they still harbor central, supermassive black holes, which could generate energetic particles if they are spinning.

Derived from text

Cosmic Rays; Galaxies; Radiation Counters

20040010576 NASA Goddard Space Flight Center, Greenbelt, MD, USA

How to Build a Supermassive Black Hole

Wanjek, Christopher; Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NASA astronomer Kim Weaver has got that sinking feeling. You know, it's that unsettling notion you get when you sift through your X-ray data and, to your surprise, find mid-sized black holes sinking toward the center of a galaxy, where they merge with others to form a single supermassive black hole. Could such a thing be true? These would be the largest mergers since America On Line bought Time-Warner, and perhaps even more violent. The process would turn a starburst galaxy inside out, making it more like a quasar host galaxy. Using the Chandra X-Ray Observatory, Weaver saw a hint of this fantastic process in a relatively nearby starburst galaxy named NGC 253 in the constellation Sculptor. She noticed that starburst galaxies - those gems set aglow in a colorful life cycle of hyperactive star birth, death, and renewal - seem to have a higher concentration of mid-mass black holes compared to other galaxies.

Author

Black Holes (Astronomy); Starburst Galaxies; X Ray Astronomy

20040010578 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Journey to the Center of a Neutron Star

Wanjek, Christopher; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A neutron star is not a place most would want to visit. This dense remnant of a collapsed star has a magnetic field billions of times stronger than Earth's, enough to shuffle your body's molecules long before you even land. The featureless surface is no fun either. Crushing gravity ensures that the star is a near perfect sphere, compressing all matter so that a sand-grain-sized scoop of neutron star material would weigh as much as a battleship on Earth. At least black holes offer the promise of funky singularity, time warps, and the Odyssean temptation to venture beyond a point of no return. What's a journey to a neutron star good for, one might ask? Well, for starters, it offers the possibility of confirming a theorized state of matter called quark-gluon plasma, which likely existed for a moment after the Big Bang and now might only exist in the superdense interiors of neutron stars. Beneath the neutron star crust, a kilometer-thick plate of crystalline matter, lies the great unknown. The popular theory is that the neutron star interior is made up of a neutron superfluid - a fluid without friction. With the help of two NASA satellites - the Rossi X-Ray Timing Explorer and the Chandra X-Ray Observatory - scientists are journeying to the center of a neutron star. Matter might be so compressed there that it breaks down into quarks, the building blocks of protons and neutrons, and gluons, the carrier of the strong nuclear force. To dig inside a neutron star, no simple drill bit will do. Scientists gain insight into the interior through events called glitches, a sudden change in the neutron star's precise spin rate. 'Glitches are one of the few ways we have to study the neutron star interior,' says Frank Marshall of NASA's Goddard Space Flight Center, who has used the Rossi Explorer to follow the escapades of the glitchiest of all neutron stars, dubbed the Big Glitcher and known scientifically as PSR J0537-6910.

Author

Neutron Stars; Quarks; Stellar Composition; X Ray Astronomy

20040010586 Raytheon Co., Greenbelt, MD, USA

INSPIRE

Taylor, Bill; Pine, Bill; Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

INSPIRE (Interactive NASA Space Physics Ionosphere Radio Experiment - <http://image.gsfc.nasa.gov/poetry/inspire>) is a non-profit scientific, educational organization whose objective is to bring the excitement of observing natural and manmade radio waves in the audio region to high school students and others. The project consists of building an audio frequency radio receiver kit, making observations of natural and manmade radio waves and analyzing the data. Students also learn about NASA and our natural environment through the study of lightning, the source of many of the audio frequency waves, the atmosphere, the ionosphere, and the magnetosphere where the waves travel.

Author

Atmospheric Physics; Education; Audio Frequencies; Radio Receivers

20040010619, Tennessee Univ., Knoxville, TN, USA

Calabi-Yau Black Holes

Shamkova, M.; Oct. 1997; 14 pp.; In English

Report No.(s): DE2003-813111; No Copyright; Avail: Department of Energy Information Bridge

Recently supersymmetric black holes become a natural theoretical laboratory for string theory. Calculation of black hole

entropy by counting microscopic configurations and comparison of these results with one obtained by classical macroscopic calculations is a very powerful tool in the laboratory. In this paper we will focus on macroscopic calculations of the black hole entropy as the area of the black hole horizon. We will give a solution for $N=2$ extreme holes associated with the general Calabi-Yau moduli space.

NTIS

Black Holes (Astronomy); String Theory

20040010626

Gamma-Ray Blazar Content of the Northern Sky

Sowards-Emmerd, D.; Romani, R. W.; Michelson, P. F.; 2003; 18 pp.; In English

Report No.(s): DE2003-813316; SLAC-PUB-10064; No Copyright; Avail: Department of Energy Information Bridge

Using survey data, we have re-evaluated the correlation of flat spectrum radio sources with EGRET sources in the Northern sky. An analysis incorporating the radio and X-ray properties and the gamma ray source localization is used to gauge the reliability of associations and to search for counterparts of previously unidentified EGRET sources. Above straight line b straight line=10 degrees, where the classification is complete, we find that 70% of the Northern EGRET sources have counterparts similar to the bright EGRET blazars. For several of these we identify known blazar counterparts more likely than the earlier proposed 3EG association; for approx. 20 we have new identifications. Spectroscopic confirmation of these candidates is in progress and we have found flat spectrum radio quasars and BL Lac counterparts with redshifts as high as 4. We also find strong evidence for a set of 28 objects with no plausible counterpart like the known EGRET blazars. These thus represent either a new extragalactic population or a population of Galactic objects with a large scale height. The survey has been extended into the plane, where we find several new blazar candidates; the bulk of the sources are, however, Galactic. Looking ahead to the GLAST era, we predict that several of the present 3EG sources are composite and that higher resolution data will break these into multiple blazar IDs.

NTIS

Gamma Rays; Blazars; Radio Sources (Astronomy)

20040010628

Cosmological Calculation Suggesting a Threshold for New Physics at 5 Tev

Noyes, H. P.; Jul. 21, 2003; 14 pp.; In English

Report No.(s): DE2003-813322; SLAC-PUB-10072; No Copyright; Avail: Department of Energy Information Bridge

A calculation by E.D.Jones of the cosmological mass scale for the phase transition from pre-geometric to physical description as about 5 Tev could be interpreted as a prediction of an effective threshold for novel physical effects in particle-particle collisions.

NTIS

Cosmology; Computation; Threshold Detectors (Dosimeters)

20040012835 Smithsonian Astrophysical Observatory, Cambridge, MA, USA

Disentangling X-Ray Emission Processes in Vela-Like Pulsars

Gaensler, Bryan; Mushotzky, Richard, Technical Monitor; September 2003; 13 pp.; In English

Contract(s)/Grant(s): NAG5-11376; No Copyright; Avail: CASI; [A03](#), Hardcopy

We present a deep observation with the X-Ray Multimirror Mission of PSR B1823-13, a young pulsar with similar properties to the Vela pulsar. We detect two components to the X-ray emission associated with PSR B1823-13: an elongated core of extent 30 min immediately surrounding the pulsar embedded in a fainter, diffuse component of emission 5 sec in extent, seen only on the southern side of the pulsar. The pulsar itself is not detected, either as a point source or through its pulsations. Both components of the X-ray emission are well fitted by a power-law spectrum, with photon index Γ approx. 1.6 and X-ray luminosity (0.5-10 keV) $L(\text{sub X})$ approx. 9×10^{32} ergs/s for the core and Γ approx. 2.3 and $L(\text{sub X})$ approx. 3×10^{33} ergs/s for the diffuse emission, for a distance of 4 kpc. We interpret both components of emission as corresponding to a pulsar wind nebula, which we designate G18.0-0.7. We argue that the core region represents the wind termination shock of this nebula, while the diffuse component indicates the shocked downstream wind. We propose that the asymmetric morphology of the diffuse emission with respect to the pulsar is the result of a reverse shock from an associated supernova remnant, which has compressed and distorted the pulsar-powered nebula. Such an interaction might be typical for

pulsars at this stage in their evolution. The associated supernova remnant is not detected directly, most likely being too faint to be seen in existing X-ray and radio observations.

Author

Pulsars; X Ray Astronomy; X Ray Sources; Nebulae; Supernova Remnants

20040012871 Stanford Linear Accelerator Center, Stanford, CA, USA

Gamma-ray Polarimetry

Tajima, H.; Jan. 2003; 10 pp.; In English

Report No.(s): DE2003-812632; SLAC-PUB-9638; No Copyright; Avail: Department of Energy Information Bridge

An astrophysics application of a low noise Double-sided Silicon Strip Detector (DSSD) is described. A Semiconductor Multiple-Compton Telescope (SMCT) is being developed to explore the gamma-ray universe in the 0.1-20 MeV energy band. Excellent energy resolution and polarization sensitivity are key features of the SMCT.

NTIS

Astrophysics; Gamma Rays; Polarimetry; Semiconductors (Materials)

20040012958 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Future Facilities for Gamma-Ray Pulsar Studies

Thompson, D. J.; Young Neutron Stars and Their Environments: IAU Symposium; [2003]; Volume 218, pp. 1-6; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; [A02](#), Hardcopy

Pulsars seen at gamma-ray energies offer insight into particle acceleration to very high energies, along with information about the geometry and interaction processes in the magnetospheres of these rotating neutron stars. During the next decade, a number of new gamma-ray facilities will become available for pulsar studies. This brief review describes the motivation for gamma-ray pulsar studies, the opportunities for such studies, and some specific discussion of the capabilities of the Gamma-ray Large Area Space Telescope (GLAST) Large Area Telescope (LAT) for pulsar measurements.

Author

Gamma Ray Telescopes; Pulsars; Gamma Ray Observatory; Gamma Ray Astronomy

20040012963 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Gamma-Ray Bursts and Cosmology

Norris, Jay P.; [2003]; 6 pp.; In English; JENAM Mini-Symposium; No Copyright; Avail: CASI; [A02](#), Hardcopy

The unrivalled, extreme luminosities of gamma-ray bursts (GRBs) make them the favored beacons for sampling the high redshift Universe. To employ GRBs to study the cosmic terrain -- e.g., star and galaxy formation history -- GRB luminosities must be calibrated, and the luminosity function versus redshift must be measured or inferred. Several nascent relationships between gamma-ray temporal or spectral indicators and luminosity or total energy have been reported. These measures promise to further our understanding of GRBs once the connections between the luminosity indicators and GRB jets and emission mechanisms are better elucidated. The current distribution of 33 redshifts determined from host galaxies and afterglows peaks near $z \sim 1$, whereas for the full BATSE sample of long bursts, the lag-luminosity relation predicts a broad peak $z \sim 1-4$ with a tail to $z \sim 20$, in rough agreement with theoretical models based on star formation considerations. For some GRB subclasses and apparently related phenomena -- short bursts, long-lag bursts, and X-ray flashes -- the present information on their redshift distributions is sparse or entirely lacking, and progress is expected in Swift era when prompt alerts become numerous.

Author

Cosmology; Gamma Ray Bursts; Luminosity; Astrophysics

20040013005 Tokyo Univ., Japan

High-Energy Particle Acceleration in the Heliosphere

Oka, Mitsuo; Terasawa, Toshio; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 17-24; In English; See also 20040012998; Copyright; Avail: Other Sources

For the development of space weather forecast, it is important to achieve the prediction of the flux of high energy particles which are associated with solar flares and CMEs. Recent studies have revealed that the cause of the high energy particles is deeply related to the interplanetary shocks originated from these eruptive phenomena. The investigations of particle acceleration mechanisms in the interplanetary space have also contributed to the elucidation of the origin of the high energy

cosmic ray particles. In this report, some topics from the interplanetary observations are presented.

Author

Space Weather; Solar Flares; Particle Acceleration

91

LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20040010556 Lunar and Planetary Inst., Houston, TX, USA

Space Science Reference Guide, 2nd Edition

Dotson, Renee, Editor; [2003]; ISSN 0161-5297; In English; See also 20040010557 - 20040010614; Original contains color and black and white illustrations

Contract(s)/Grant(s): NASW-4574; NCC5-606

Report No.(s): LPI-Contrib-1154; Copyright; Avail: CASI; [C01](#), CD-ROM

This Edition contains the following reports: GRACE: Gravity Recovery and Climate Experiment; Impact Craters in the Solar System; 1997 Apparition of Comet Hale-Bopp Historical Comet Observations; Baby Stars in Orion Solve Solar System Mystery; The Center of the Galaxy; The First Rock in the Solar System; Fun Times with Cosmic Rays; The Gamma-Ray Burst Next Door; The Genesis Mission: An Overview; The Genesis Solar Wind Sample Return Mission; How to Build a Supermassive Black Hole; Journey to the Center of a Neutron Star; Kepler's Laws of Planetary Motion; The Kuiper Belt and Oort Cloud ; Mapping the Baby Universe; More Hidden Black Hole Dangers; A Polarized Universe; Presolar Grains of Star Dust: Astronomy Studied with Microscopes; Ring Around the Black Hole; Searching Antarctic Ice for Meteorites; The Sun; Astrobiology: The Search for Life in the Universe; Europa and Titan: Oceans in the Outer Solar System?; Rules for Identifying Ancient Life; Inspire ; Remote Sensing; What is the Electromagnetic Spectrum? What is Infrared? How was the Infrared Discovered?; Brief History of Gyroscopes ; Genesis Discovery Mission: Science Canister Processing at JSC; Genesis Solar-Wind Sample Return Mission: The Materials ; ICESat: Ice, Cloud, and Land Elevation Satellite ICESat: Ice, Cloud, and Land; Elevation Satellite ICESat: Ice, Cloud, and Land Elevation Satellite ICESat: Ice, Cloud, and Land Elevation Satellite ICESat: Ice, Cloud, and Land Elevation Satellite Measuring Temperature Reading; The Optical Telescope ; Space Instruments General Considerations; Damage by Impact: The Case at Meteor Crater, Arizona; Mercury Unveiled; New Data, New Ideas, and Lively Debate about Mercury; Origin of the Earth and Moon; Space Weather: The Invisible Foe; Uranus, Neptune, and the Mountains of the Moon; Dirty Ice on Mars; For a Cup of Water on Mars; Life on Mars?; The Martian Interior; Meteorites from Mars, Rocks from Canada; Organic Compounds in Martian Meteorites May be Terrestrial Contaminants; Bands on Europa; Big Mountain, Big Landslide on Jupiter's Moon, Io; Cratering of the Moon; Europa's Salty Surface; The Europa Scene in the Voyager-Galileo Era; Explosive Volcanic Eruptions on the Moon; Ice on the Bone Dry Moon; Jupiter's Hot, Mushy Moon; The Moon Beyond 2002 ; Phases of the Moon; The Ph-D Project: Manned Expedition to the Moons of Mars; and Possible Life in a European Ocean.

CASI

Lunar Geology; Mars Surface

20040010557 Naval Research Lab., Stennis Space Center, MS, USA

Presolar Grains of Star Dust: Astronomy Studied with Microscopes

Daulton, Tyrone; Space Science Reference Guide, 2nd Edition; [2003]; 7 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The two most abundant forms of presolar grains that have been found in primitive meteorites are nanometer-sized diamond and submicron to micron sized SiC. In addition, presolar grains of graphite, carbide mineral solid solutions of Ti, V, Fe, Zr, Mo, and Ru, kamacite (FeNi), corundum (Al₂O₃), spinel (MgAl₂O₄), titanium oxide [11], hibonite, and silicon nitride have also been found in primitive meteorites. The isotopic compositions of these grains tell us about the processes of element nucleosynthesis in their source stars. The microstructure (crystal structure, lattice defects, intergrowths of several different mineral forms, etc.) of these grains tell us about the physical conditions (temperature, pressure, etc.) where the grains

formed as well as how they formed. The study of stars is no longer restricted to gazing up through telescopes. Now, astronomy can be studied by looking down through powerful electron microscopes.

Author

Composition (Property); Electron Microscopes; Astronomy

20040010560 Hawaii Univ., HI, USA

Europa's Salty Surface

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 8 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Pictures of Jupiter's moon Europa taken by the Galileo spacecraft during the past couple of years have suggested to scientists that there is now, or was in the past, an ocean beneath the satellite's frozen crust. Now a team from the University of Hawai'i, the Jet Propulsion Laboratory, the U.S. Geological Survey, and STI Inc. may have given us our first glimpse at the chemical composition of that ocean. Using data obtained by the Near-Infrared Mapping Spectrometer (NIMS) carried by Galileo, Thomas McCord (U. Hawai'i) and his colleagues examined darker regions on the surface and compared the spacecraft data to numerous chemical compounds. Their analysis indicates that the darker areas are most likely composed of deposits of salty minerals such as sulfates and carbonates. McCord and his associates believe that the minerals formed when ocean water erupted onto the surface and then evaporated, leaving behind salty deposits. They hope that further research will allow them to determine the chemical composition of Europa's hidden ocean and assess the likelihood that life could have formed in it.

Derived from text

Jupiter (Planet); Europa; Geological Surveys; Carbonates; Chemical Composition; Water

20040010561 Audentes Publishing Co., USA

Phases of the Moon

Miller, Patrick; Keating, Christopher; Sidhwa, Anahita; Space Science Reference Guide, 2nd Edition; [2003]; 1 pp.; In English; See also 20040010556; Original contains black and white illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The different phases of the Moon are caused by its revolutions about the Earth. Review what is meant by the terms new moon, full moon, first quarter, third quarter, waxing and waning crescent, and waxing and waning gibbous. Other facts about the motion of our nearest neighbor are presented.

Author

Moon; Lunar Phases

20040010565 Hawaii Univ., HI, USA

Uranus, Neptune, and the Mountains of the Moon

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 10 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Huge circular basins, marked by low regions surrounded by concentric mountain ranges, decorate the Moon. The giant holes may have formed during a short, violent period from about 3.9 to 3.8 billion years ago. Three hundred to 1000 kilometers in diameter, their sizes suggest that fast-moving objects with diameters of 20 to about 150 kilometers hit the Moon. Numerous smaller craters also formed. If most large lunar craters formed between 3.9 and 3.8 billion years ago, where were the impactors sequestered for over 600 million years after the Moon formed? One possibility has been studied with computer simulations by Harold Levison and colleagues from the Southwest Research Institute (Boulder, Colorado), Queen's University (Ontario, Canada), and NASA Ames Research Center in California. The idea, originally suggested in 1975 by George Wetherill (Carnegie Institution of Washington), is that a large population of icy objects inhabited the Solar System beyond Saturn. They were in stable orbits around the Sun for several hundred million years until, for some reason, Neptune and Uranus began to form. As the planets grew by capturing the smaller planetesimals, their growing gravitational attraction began to scatter the remaining planetesimals, catapulting millions of them into the inner Solar System. A small fraction of these objects crashed into the Moon and rocky planets, sculpturing the surfaces with immense craters. Calculations suggest that the bombardment would have lasted less than 100 million years, consistent with the ages of craters and impact basins in the lunar highlands.

Derived from text

Uranus (Planet); Neptune (Planet); Moon; Mountains; Craters

20040010566 Brown Univ., Providence, RI, USA

Explosive Volcanic Eruptions on the Moon

Weitz, Catherine M.; Space Science Reference Guide, 2nd Edition; [2003]; 7 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

If you look up at the Moon in the sky you'll see the bright highlands and the dark mare. The mare are composed of lavas that erupted billions of years ago and filled in basins created by large impacts. In addition to the mare, there are also several dark areas that have diffuse boundaries and appear more unconsolidated than the mare. These nonmare deposits are called Dark Mantle Deposits (DMDs) and they were produced from relatively explosive volcanic eruptions that hurled magma above the lunar surface. For my doctoral dissertation, I am studying samples of the dark mantle deposit from the Apollo 17 landing site and images taken by the Clementine Ultraviolet-Visible (UVVIS) camera of several of the larger, regional DMDs on the Moon (see map above). My goal is to understand how the DMDs formed and model the volcanic eruptions that emplaced them.

Author

Moon; Volcanic Eruptions

20040010567 Hawaii Univ., Honolulu, HI, USA

The Moon Beyond 2002

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 11 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over a hundred lunar scientists met in the clear mountain air of the Taos Ski Valley, September 12-14, 2002, to share their discoveries and, most importantly, their questions about the composition, geological evolution, and future exploration of the Moon. The wealth of data from the Clementine and Lunar Prospector missions, coupled with continued study of lunar samples, has led lunar scientists to pose sophisticated questions about the Moon. Because of the Moon's central role in planetary science, answers to these questions will help us understand the other rocky bodies in the Solar System. A fascinating array of missions is planned, including orbiting spacecraft and sample-return missions. Human habitation of the Moon may not be far beyond.

Author

Moon; Lunar Geology

20040010569 Chicago Univ., Chicago, IL, USA

The First Rock in the Solar System

Simon, Steven B.; Space Science Reference Guide, 2nd Edition; [2003]; 7 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

My colleagues Andrew Davis, Lawrence Grossman (both of University of Chicago), Kevin McKeegan (UCLA), and I have discovered an exceptionally refractory inclusion in the Murchison carbonaceous chondrite. It is an aggregate of corundum, hibonite, and perovskite, the three minerals expected to condense first in a hot, cooling gas of solar composition. This inclusion was one of the first rocks to form in the solar system 4.5 billion years ago. It was preserved by being sequestered rapidly from the gas and enclosed in a growing carbonaceous chondrite asteroid.

Author

Solar System Evolution; Aggregates; Meteoritic Composition; Inclusions; Refractories

20040010572 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Polarized Universe

Wanek, Christopher; Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The CMB polarization was produced as light scattered off a primordial cloud of protons and electrons nearly 14 billion years ago, about 400,000 years after the Big Bang. This marks the moment of recombination, when the universe finally cooled

enough to allow electrons to join protons. The CMB is the light that broke through the fog.

Author

Optical Polarization; Cosmic Microwave Background Radiation; Universe

20040010573 Hawaii Univ., HI, USA

Searching Antarctic Ice for Meteorites

Martel, Linda M. V.; Space Science Reference Guide, 2nd Edition; [2003]; 14 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

ANSMET meteorites represent the materials making up the solar system. The unbiased and uncontaminated sampling of meteorites recovered from the Antarctic ice sheet provides researchers with ground truth' about the materials and formation conditions of the solar nebula, asteroids, moons, and planets. Taking these rocks from space off the ice and into the laboratory is crucial to our quest to understand the history and composition of the solar system we live in. ANSMET makes annual expeditions to Antarctica to provide this much-needed continuous and readily available supply of extraterrestrial materials. Derived from text

Antarctic Regions; Meteorites; Expeditions

20040010574 Arizona Univ., Tucson, AZ, USA

Organic Compounds in Martian Meteorites May be Terrestrial Contaminants

Jull, A. J. T.; Space Science Reference Guide, 2nd Edition; [2003]; 8 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 1996, David McKay and coworkers reported evidence suggesting the possibility of fossils in the martian meteorite ALH84001 (see PSR Discoveries article Life on Mars). This work has stimulated much discussion as to the nature and origin of organic material in ALH84001, another martian meteorite, EET79001, and other martian meteorites in general. My colleagues C. Courtney, D. A. Jeffrey, and J. W. Beck and I have been investigating the origin of the organic compounds by measuring the abundances of the isotopes of carbon (C) using accelerator mass spectrometry (AMS). Important clues to the origin of the organic material can be obtained from the amounts of C-14 (frequently nicknamed radiocarbon) and the relative amounts of C-13 and C-12. Our analyses indicate that at least 80% of the organic material in ALH84001 is from Earth, not Mars, casting doubt on the hypothesis the meteorite contains a record of fossil life on Mars.

Derived from text

Organic Compounds; Mars (Planet); Meteorites; Extraterrestrial Life

20040010579 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Mapping the Baby Universe

Wanjek, Christopher; Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In June, NASA plans to launch the Microwave Anisotropy Probe (MAP) to survey the ancient radiation in unprecedented detail. MAP will map slight temperature fluctuations within the microwave background that vary by only 0.00001 C across a chilly radiation that now averages 2.73 C above absolute zero. The temperature differences today point back to density differences in the fiery baby universe, in which there was a little more matter here and a little less matter there. Areas of slightly enhanced density had stronger gravity than low-density areas. The high-density areas pulled back on the background radiation, making it appear slightly cooler in those directions.

Author

Background Radiation; Microwave Anisotropy Probe; Temperature Gradients

20040010580 Lunar and Planetary Inst., Houston, TX, USA

The Kuiper Belt and Oort Cloud

Hahn, Joe; Space Science Reference Guide, 2nd Edition; [2003]; 1 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Kuiper Belt Objects are the large approximately 100-kilometer-sized comets that orbit the Sun beyond Neptune. The

Kuiper Belt is named for the Dutch-American astronomer Gerard Kuiper, who in the 1950s suggested that there might still be some left-over planetesimal debris at the outer edge of the solar system. These icy bodies were presumed to reside in a flattened disk orbiting beyond the most distant giant planet, Neptune. Kuiper Belt Objects remained undiscovered until 1992 when telescopes became large and sensitive enough to detect these distant faint objects. It is estimated that there are perhaps 10x5 Kuiper Belt Objects having diameters larger than 100 kilometers orbiting at distances of 30-50 AU from the Sun. However, there may be an even larger unseen population of perhaps 10x10 small, kilometersized Kuiper Belt Objects that are too small and dim to be seen with current telescopes.

Author

Kuiper Belt; Oort Cloud; Neptune (Planet)

20040010581 NASA Goddard Space Flight Center, Greenbelt, MD, USA

More Hidden Black Hole Dangers

Wanjek, Christopher; Space Science Reference Guide, 2nd Edition; [2003]; 3 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Black holes such as GRO J1655-40 form from collapsed stars. When stars at least eight times more massive than our Sun exhaust their fuel supply, they no longer have the energy to support their tremendous bulk. These stars explode as supernovae, blasting their outer envelopes into space. If the core is more than three times the mass of the Sun, it will collapse into a singularity, a single point of infinite density. Although light cannot escape black holes, astronomers can see black holes by virtue of the hot, glowing gas often stolen from a neighboring star that orbits these objects. From our vantage point, the light seems to flicker. The Rossi Explorer has recorded this flickering (called quasiperiodic oscillations, or QPOs) around many black holes. QPOs are produced by gas very near the innermost stable orbit the closest orbit a blob of gas can maintain before falling pell-mell into the black hole. As gas whips around the black hole at near light speed, gravity pulls the gas in one direction, then another, adding to the flickering. The QPO is related to the speed and size of this orbit and the mass of the black hole.

Author

Black Holes (Astronomy); Gravitational Collapse; Oscillations; High Temperature Gases

20040010582 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Ring Around the Black Hole

Wanjek, Christopher; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Regardless of size, black holes easily acquire accretion disks. Supermassive black holes can feast on the bountiful interstellar gas in galactic nuclei. Small black holes formed from collapsing stars often belong to binary systems in which a bulging companion star can spill some of its gas into the black hole's reach. In the chaotic mess of the accretion disk, atoms collide with one another. Swirling plasma reaches speeds upward of 10% that of light and glows brightly in many wavebands, particularly in X-rays. Gas gets blown back by a wind of radiation from the inner disk. New material enters the disks from different directions.

Author

Black Holes (Astronomy); Accretion Disks; Hole Geometry (Mechanics); Plasmas (Physics)

20040010598 Hawaii Univ., HI, USA

Dirty Ice on Mars

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 12 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The gamma-ray and neutron spectrometers onboard the orbiting 2001 Mars Odyssey spacecraft have detected strong signals from hydrogen quite close to the Martian surface. The concentration of hydrogen is so large that it must be in the form of ice. The amount of ice in the upper meter or so begins to rise at about -60 deg. latitude and continues to increase toward the South Pole. Detailed analysis of the data indicates that the ice-rich layer resides beneath a hydrogen-poor upper layer. The thickness of the upper layer decreases from about 75 cm at -42 deg. to about 20 cm at -77 deg. The amount of ice in the lower layer is between 20 and 50 wt% (weight percent), with a best estimate of 35 wt%. Because ice is much less dense than mineral

grains, this translates to more ice than rock by volume. It's dirty ice. The results were reported in papers by William Boynton (University of Arizona) and the gamma-ray team, by William Feldman (Los Alamos National Laboratory) and others, and Igor Mitrofanov (Russian Space Research Institute) and others.

Derived from text

Hydrogen; Ice; Mars Exploration; Mars Surface; Minerals; Rocks

20040010599 Hawaii Univ., HI, USA

For a Cup of Water on Mars: Gusev Crater

Martel, Linda M. V.; Space Science Reference Guide, 2nd Edition; [2003]; 7 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Though liquid water is not stable on the surface of Mars today, there are hints in the martian landscape that water once flowed there, eroding valleys and depositing sediments. Understanding where water is, or was, on Mars is a crucial step in looking for life on this smaller, cooler neighbor of Earth. Satellite images, beginning in the early 1970s with Mariner 9 up to the current Mars Global Surveyor, have given us increasingly detailed looks at the surface of Mars, including those intriguing channels that resemble dry river valleys. Warmer temperatures and a higher surface pressure once made it possible for liquid water to exist on the surface of Mars. When the water existed and where it went are just two of the questions being studied today. A larger question has to do with martian life. If the wetter, early environment on Mars supported life, then where are the most appropriate places to look for evidence of life? The answer seems to be channels and ancient lake beds. Nathalie Cabrol and colleagues at NASA Ames Research Center, the Vernadsky Institute in Moscow, and Arizona State University recently published their study of a valley and impact crater on Mars which together had a prolonged history of water-related activity. The researchers established a sequence of events for the Ma'adim Vallis/Gusev crater area that included flowing water, ponding, and sedimentation over a period of a couple of billion years. This history makes Gusev crater a prominent depositional site and, as we'll consider, a key location for future biological explorations on Mars.

Derived from text

Craters; Drying; Mars Craters; Mars Surface; Topography; Water

20040010600 Hawaii Univ., HI, USA

Life on Mars?

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

People have long wondered if life could have existed or even still exists on Mars. The Viking landers in 1976 searched for signs of life in the red soil, but found no clear-cut evidence. Future missions are planned to search other terrains on Mars, such as areas where water must have flowed in rivers and formed lakes that eventually dried up. But the search has already started. A group of investigators at the Johnson Space Center and Stanford University has revealed evidence from an intense, careful study of a meteorite from Mars that tiny bacteria-like creatures may have lived in cracks in the rock. In this first issue of PSR Discoveries, we describe evidence the researchers have assembled, and present some of the non-biological alternatives other scientists have proposed. We intend to follow the debate as it unfolds during the coming months or, perhaps, years.

Derived from text

Water; Soils; Planetary Geology; Mars Surface; Lakes; Extraterrestrial Life; Bacteria

20040010601 Hawaii Univ., HI, USA

The Martian Interior

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 9 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Viking missions in the mid-1970s and the recent Mars Pathfinder mission have shown us what the surface of Mars is like at three places. Their instruments have revealed the chemical composition of the surface and individual rocks. Exciting as those missions were, they literally only scratched the surface. One of the most important things to learn about the planets is the nature of their interiors because much of the story of their formation and geological evolution is recorded in the chemical composition and minerals inside the rocky planets. Estimates of the chemical composition of the interior of Mars have been made on the basis of the compositions of martian meteorites, some chemical reasoning, and judicious assumptions. However,

until recently, the actual minerals present at different depths in the interior could only be guessed because no comprehensive experiments had been conducted at the high pressures and temperatures appropriate to the interior of Mars. Those experiments have now been done by Drs. Constance M. Bertka and Yingwei Fei of the Geophysical Laboratory of the Carnegie Institution of Washington. Although application of their experiments to Mars still requires some assumptions about how temperature varies with depth and the composition and size of the metallic core at its center, Bertka and Fei suggest that the martian mantle has two main layers, one extending from a depth of about 50 km (at the base of the crust) to around 1100 km, a second from 1100 km to about 1800 km, and a third thin layer occupying a zone about 100-200 km thick above the metallic core.

Derived from text

Chemical Composition; Crusts; Geophysics; Mars Surface; Planetary Mantles

20040010602 Hawaii Univ., HI, USA

Meteorites from Mars, Rocks from Canada

Friedman, Rachel C.; Space Science Reference Guide, 2nd Edition; [2003]; 10 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Meteorites from Mars have been in the news since last summer's announcement about possible fossils in a martian meteorite; see the October, 1996 Hot Idea of PSR Discoveries. But there is more to the study of martian meteorites than the search for life. These igneous rocks contain detailed information about volcanism and other magmatic processes on the Red Planet. Mars had a very active igneous history, dotting the landscape with huge volcanoes and covering extensive areas with sheets of lava. Images of the surface of Mars taken from orbit showed us these volcanic wonders from afar. The meteorites we have in hand provide us with more detailed information of what we glimpsed in the images. One of the groups of meteorites thought to have come from Mars, the nakhlites [nock-lites], has an unusual composition characterized by a high abundance of the mineral pyroxene. Many experts have attributed the composition to accumulation of pyroxene in a thick magma body beneath the surface. However, some features of the rock indicate more rapid crystallization, suggesting formation in a lava flow. This has led to some confusing interpretations about the origin of these rocks. Were nakhlites formed underground or on the surface? Geologists need to answer this question so we can know if we are studying the physics of martian lava flows on the surface or the physics of how magma moves inside a volcano. What we need is information about the occurrence of the nakhlites on Mars. Collecting them directly from a martian lava flow would be ideal. But, until numerous robotic rovers and humans roam the surface of Mars, we will not have such important field information. Fortunately, a very similar rock type occurs in a few places on Earth. You are invited to come along on a field trip to eastern Ontario, Canada.

Derived from text

Canada; Rocks; Meteorites; Mars Surface; Geological Surveys; SNC Meteorites; Volcanoes

20040010603 Hawaii Univ., HI, USA

Bands on Europa

Martel, Linda M. V.; Space Science Reference Guide, 2nd Edition; [2003]; 10 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

High-resolution Galileo images of Jupiter's icy moon Europa show linear, curved, and wedge-shaped bands crisscrossing the surface. The bands are one of five primary terrain types previously mapped on Europa; the other types are plains, chaos, ridge, and crater materials [see PSRD article: The Europa Scene in the Voyager-Galileo Era.] Now a team of scientists from the Applied Physics Lab (APL), Brown University, Cornell University, the Nordic Volcanological Institute (Iceland), and the Institute of Planetary Exploration (Germany) have made detailed maps of five distinct bands. Louise Prockter (APL) and her colleagues compare the European bands to Earth's mid-ocean ridges. They discuss fast-spreading and slow-spreading models for the European bands showing how warm ice may have welled up to the surface through fractures. The team concludes that mid-ocean ridge rifting is a good analogy for European band formation, that bands were responsible for hemisphere-wide resurfacing on Europa, and that the style of resurfacing has changed over time.

Derived from text

Jupiter (Planet); Craters; Fractures (Materials); Geological Faults; Ice

20040010604 Audentes Publishing Co., USA

Cratering of the Moon

Miller, Patrick; Keating, Christopher; Sidhwa, Anahita; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Between the orbits of Mars and Jupiter are believed to be millions (if not billions) of irregularly shaped chunks of rock called asteroids. They are located at an average distance of 3 astronomical units (AU) from the Sun. The largest of these is named Ceres and is 770 kilometers (480 miles) in diameter. The two moons of Mars, Phobos and Deimos, are believed to be asteroids captured in orbit around Mars by its gravitational field. The gas giant Jupiter has 16 known moons, some of which are believed to be asteroids captured by Jupiter's gravitational field. The four largest of Jupiter's moons, called the Galilean moons after their discovery in 1610 by Galileo, are the same size or larger than the Earth's Moon. These are not believed to be captured asteroids but instead are believed to have condensed out of the original solar nebula around the planet Jupiter in the same manner as Jupiter and the other planets. From time to time, the gravitational field of the massive planet Jupiter 'kicks' some of the asteroids out of their orbit and into a new orbit that lies in part in the inner solar system. That is, the 'kicked' asteroids sweep down into the inner solar system where the terrestrial planets are located (Mercury, Venus, Earth, and Mars).
Derived from text

Cratering; Moon; Rocks; Solar Nebula; Asteroids

20040010605 Hawaii Univ., HI, USA

Big Mountain, Big Landslide on Jupiter's Moon, Io

Martel, Linda M. V.; Space Science Reference Guide, 2nd Edition; [2003]; 5 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Clear evidence of what this internal heat is doing to Io's surface was first revealed in the 1979 Voyager spacecraft images. Spectacular scenes of active volcanic eruption plumes, a surface lacking any signs of impact craters, and scattered mountains towering 10 kilometers above the yellowish plains make Io one of the most unusual and geologically active bodies in our Solar System. In fact, Io is so volcanically active that it is resurfaced at an average rate of 1 cm/year. This probably leads to recycling of the most deeply buried volcanic rocks. Photogeologic mapping by Gerald Schaber in the early 1980s showed three main units: smooth plains, vent-related materials, and mountain materials. While the plains and vent-related materials have been attributed to volcanic activity, Io's mountains may not be mere volcanoes and their origin remains a hot topic of research. Paul Schenk (Lunar and Planetary Institute) and Mark Bulmer (Center for Earth and Planetary Science, National Air and Space Museum) studied the geology of Io's prominent mountain Euboea Montes (47 deg S, 336 deg W). Their report in Science describes a detailed look at the shape of Euboea Montes and evidence for a landslide on it. Schenk and Bulmer consider the implications of their study on mountain formation on Io and the structure and stability of the crust. Their report is summarized below.

Derived from text

Craters; Geology; Igneous Rocks; Io; Jupiter (Planet); Photomapping; Volcanoes

20040010606 Hawaii Univ., HI, USA

The Europa Scene in the Voyager-Galileo Era

Martel, Linda M. V.; Space Science Reference Guide, 2nd Edition; [2003]; 9 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Current Galileo Mission data are giving us the closest views of Jupiter's icy moon, Europa, since Voyager images first revealed the surface 20 years ago. The icy crust is smooth and blocky, with a banded and broken-puzzle appearance. Europa's outer shell, intriguing to geologists and astrobiologists alike, has been cited as evidence supporting a subsurface-ocean hypothesis. Two articles in a recent Galileo Mission special section of the Journal of Geophysical Research (Planets) review the water-ice surface, major geologic units, and the search for current geologic activity on Europa. Ronald Greeley (Arizona State University) and colleagues from universities, NASA, U. S. Geological Survey, and the National Optical Astronomy Observatories provide an extensive compilation of Europa's primary geologic units as a framework for further mapping of the surface. In another analysis of Galileo images, Cynthia Phillips of the University of Arizona (now at the SETI Institute) and colleagues from ASU, Brown, and JPL look for changes on the surface of Europa since Voyager. They also look for evidence of current geologic activity in the form of active plumes. Not finding proof of surface change and plumes, they give estimates of surface age and surface alteration rates on Europa.

Derived from text

Crusts; Data Acquisition; Europa; Geological Surveys; Ice; Planets; Data

20040010607 George Mason Univ., Fairfax, VA, USA

The Ph-D Project: Manned Expedition to the Moons of Mars

Singer, S. Fred; Space Science Reference Guide, 2nd Edition; [1996]; 9 pp.; In English; See also 20040010556; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Ph-D mission involves the transfer of approximately eight men (and women), six planetary plus two medical scientists, from Earth orbit to Deimos, the outer satellite of Mars. There follows a sequential program of unmanned exploration of the surface of Mars by means of some ten to twenty unmanned rover vehicles, each of which returns Mars samples to the Deimos laboratory. A two-man sortie descends to the surface of Mars to gain a direct geological perspective and develop priorities in selecting samples. At the same time, four of the astronauts conduct a coordinated program of exploration (including sample studies) of Phobos and Deimos. Bringing men close to Mars to control exploration is shown to have scientific and other advantages over either (i) control from the Earth and (ii) a manned Mars landing. The mission is envisaged to take place after 2010, and to last about two years (including a three- to six-month stay at Deimos). Depending on then-available technology, take-off weight from Earth orbit is of the order of 300 tons. A preferred mission scheme may preposition propellants and equipment at Deimos by means of slow freight, possibly using a gravity boost from Venus. It will be followed by a manned express that conveys the astronauts more rapidly to Deimos. Both chemical and electric propulsion are used in this mission, as appropriate. Electric power is derived from solar and nuclear sources. Assuming that certain development costs can be shared with space station programs, the incremental cost of the project is estimated as less than \$40 billion (in 1998 dollars), expended over a 15-year period.

Author

Deimos; Phobos; Manned Mars Missions

20040010609 Lunar and Planetary Inst., Houston, TX, USA

Impact Craters in the Solar System

Kiefer, Walter S.; Space Science Reference Guide, 2nd Edition; [2003]; 4 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As of 2002, fewer than 200 impact craters have been recognized on Earth. Since erosion has removed traces of most craters on Earth, cratering trends can be observed more easily on the Moon where there is a much larger and better preserved crater population. On the Moon a direct relationship can be observed between the size and structure of craters. Lunar craters can be placed on a continuum from small simple craters to large complex craters with terracing and central peaks. The age of terrain on the Moon and other solar system bodies can be estimated from crater density. The characteristics of craters on solar system bodies reveals clues about composition and past geologic activity as well.

Author

Planetary Geology; Cratering; Lunar Craters

20040010610 Hawaii Univ., Kula, HI, USA

1997 Apparition of Comet Hale-Bopp Historical Comet Observations

Meech, Karen; Space Science Reference Guide, 2nd Edition; [2003]; 6 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Comets were objects of much speculation among the early Greek astronomers, some of whom considered them to be planetary in nature, and others, such as Aristotle, considered them to be more of an atmospheric phenomena, such as meteors. The first real scientific facts known about comets were due to the observations of the great observer Tycho Brahe (1546-1601). Brahe made measurements of the position of the Great Comet of 1577 and determined from its parallax that it was a distant object, much farther away than the Moon, and therefore not an atmospheric phenomenon as many had believed. According to Chambers (1909), there are only a handful of comets which may be considered to be 'remarkable'. We might expect an exceptional comet on average only 3 times per century. These remarkable comets are noteworthy for their extended visibility (including daytime visibility), and their exceptional brightness and spectacular features, which included reddish colors, multiple tails, jets and haloes.

Derived from text

Comets; Histories

20040010613 Lunar and Planetary Inst., Houston, TX, USA

Ice on the Bone Dry Moon

Spudis, Paul D.; Space Science Reference Guide, 2nd Edition; [2003]; 7 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An abundant supply of water on the Moon would make establishment of a self-sustaining lunar colony much more feasible and less expensive than presently thought. Study of lunar samples revealed that the interior of the Moon is essentially devoid of water, so no underground supplies could be used by lunar inhabitants. However, the lunar surface is bombarded with water-rich objects such as comets, and scientists have suspected that some of the water in these objects could migrate to permanently dark areas at the lunar poles, perhaps accumulating to useable quantities. Analysis of data returned from a radio-wave experiment performed in 1994 while the Clementine spacecraft was orbiting the Moon reveals that deposits of ice exist in permanently dark regions near the south pole of the Moon. Initial estimates suggest that the volume of small lake exists, 1 billion cubic meters. For comparison, this amount of water would be equivalent to the fuel (hydrogen and oxygen) used for more than a million launches of the Space Shuttle from Cape Canaveral!

Author

Lunar Surface; Ice

20040010614 Hawaii Univ., Honolulu, HI, USA

Jupiter's Hot, Mushy Moon

Taylor, G. Jeffrey; Space Science Reference Guide, 2nd Edition; [2003]; 7 pp.; In English; See also 20040010556; Original contains color and black and white illustrations; Copyright; Avail: CASI; [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Jupiter's moon Io is the most volcanically active body in the Solar System. Observations by instruments on the Galileo spacecraft and on telescopes atop Mauna Kea in Hawai'i indicate that lava flows on Io are surprisingly hot, over 1200 oC and possibly as much as 1300 oC; a few areas might have lava flows as hot as 1500 oC. Such high temperatures imply that the lava flows are composed of rock that formed by a very large amount of melting of Io's mantle. This has led Laszlo Keszthelyi and Alfred S. McEwen of the University of Arizona and me to reawaken an old hypothesis that suggests that the interior of Io is a partially-molten mush of crystals and magma. The idea, which had fallen out of favor for a decade or two, explains high-temperature hot spots, mountains, calderas, and volcanic plains on Io. If correct, Io gives us an opportunity to study processes that operate in huge, global magma systems, which scientists believe were important during the early history of the Moon and Earth, and possibly other planetary bodies as well. Though far from proven, the idea that Io has a ocean of mushy magma beneath its crust can be tested with measurements by future spacecraft.

Author

Io; Volcanic Eruptions

20040010615

Brane Gas Cosmology, M-Theory and Little String Theory

Alexander, S. H. S.; Jan. 2003; 12 pp.; In English

Report No.(s): DE2003-812630; SLAC-PUB-9635; No Copyright; Avail: Department of Energy Information Bridge

We generalize the Brane Gas Cosmological Scenario to M-theory degrees of freedom, namely M5 and M2 branes. Without brane intersections, the Brandenberger Vafa(BV) arguments applied to M-theory degrees of freedom generically predict a large 6 dimensional spacetime. We show that intersections of M5 and M2 branes can instead lead to a large 4 dimensional spacetime. One dimensional intersections in 11D is related to (2,0) little strings (LST) on NS5 branes in type IIA. The gas regime of membranes in M-theory corresponds to the thermodynamics of LST obtained from holography. We propose a mechanism whereby LST living on the world volume of NS5 (M5)-branes wrapping a five dimensional torus, annihilate most efficiently in 3+1 dimensions leading to a large 3+1 dimensional spacetime. We also show that this picture is consistent with the gas approximation in M-theory.

NTIS

String Theory; Thermodynamics; Cosmology; Holography

20040010699 Rutherford Appleton Lab., Oxford, UK, Durham Univ., UK

Translation of the Observations of Meteors Recorded in the Koryo-sa

York, T. J.; Wild, M. N.; Dec. 2003; 72 pp.; In English

Report No.(s): PB2004-102119; RAL-TR-2003-021; Copyright; Avail: National Technical Information Service (NTIS)

The following is a rendition into English of part of the astronomical treatise (chapters 47 to 49) of the Koryo-sa (History of the Kingdom of Koryo). The Koryo dynasty ruled Korea from AD918 to 1392; these chapters list a large number of astronomical observations of all kinds from approximately AD1000 to the dynasty's end. The history, the earliest version of which was written in 1395, is based upon the Sillok (Veritable Records; day to day annals) of the Koryo dynasty, which no longer exist. The final version of the Koryo-sa was compiled between 1445 and 1451 under the direction of Chong In-ji. This report includes observations of meteors, which are indicated in the treatise by the standard phrase *liu xing*, flowing star.

NTIS

Meteoroids; Korea

20040010821 NASA Ames Research Center, Moffett Field, CA, USA

Essential Autonomous Science Inference on Rovers (EASIR)

Roush, Ted L.; Shipman, Mark; Morris, Robert; Gazis, Paul; Pedersen, Liam; [2003]; 10 pp.; In English; 2004 IEEE Aerospace Conference, 2004

Contract(s)/Grant(s): UPN 21-896-30-06

Report No.(s): IEEAC Paper 1328; Copyright; Avail: CASI; [A02](#), Hardcopy

Existing constraints on time, computational, and communication resources associated with Mars rover missions suggest on-board science evaluation of sensor data can contribute to decreasing human-directed operational planning, optimizing returned science data volumes, and recognition of unique or novel data. All of which act to increase the scientific return from a mission. Many different levels of science autonomy exist and each impacts the data collected and returned by, and activities of, rovers. Several computational algorithms, designed to recognize objects of interest to geologists and biologists, are discussed. The algorithms represent various functions that producing scientific opinions and several scenarios illustrate how the opinions can be used.

Author

Autonomy; Mars Roving Vehicles; Inference; NASA Space Programs; Aerospace Sciences

20040010824 NASA Ames Research Center, Moffett Field, CA, USA

NASA's MERBoard: An Interactive Collaborative Workspace Platform, Chapter 4

Trimble, Jay; Wales, Roxana; Gossweiler, Rich; [2003]; 27 pp.; In English; No Copyright; Avail: CASI; [A03](#), Hardcopy

This chapter describes the ongoing process by which a multidisciplinary group at NASA's Ames Research Center is designing and implementing a large interactive work surface called the MERBoard Collaborative Workspace. A MERBoard system involves several distributed, large, touch-enabled, plasma display systems with custom MERBoard software. A centralized server and database back the system. We are continually tuning MERBoard to support over two hundred scientists and engineers during the surface operations of the Mars Exploration Rover Missions. These scientists and engineers come from various disciplines and are working both in small and large groups over a span of space and time. We describe the multidisciplinary, human-centered process by which this h4ERBoard system is being designed, the usage patterns and social interactions that we have observed, and issues we are currently facing.

Author

Mars Exploration; Mars Surface; NASA Space Programs; Mars Roving Vehicles; Human-Computer Interface

20040012678 QSS Group, Inc., Moffett Field, CA, USA

Terrain Model Registration for Single Cycle Instrument Placement

Deans, Matthew; Kunz, Clay; Sargent, Randy; Pedersen, Liam; October 06, 2003; 6 pp.; In English; IEEE IROS 2003, 27-31 Oct. 2003, Las Vegas, NV, USA; No Copyright; Avail: CASI; [A02](#), Hardcopy

This paper presents an efficient and robust method for registration of terrain models created using stereo vision on a planetary rover. Our approach projects two surface models into a virtual depth map, rendering the models as they would be seen from a single range sensor. Correspondence is established based on which points project to the same location in the virtual range sensor. A robust norm of the deviations in observed depth is used as the objective function, and the algorithm searches for the rigid transformation which minimizes the norm. An initial coarse search is done using rover pose information from odometry and orientation sensing. A fine search is done using Levenberg-Marquardt. Our method enables a planetary rover to keep track of designated science targets as it moves, and to hand off targets from one set of stereo cameras to another. These capabilities are essential for the rover to autonomously approach a science target and place an instrument in contact in a single command cycle.

Author

Stereoscopic Vision; Terrain; Mars Roving Vehicles; Mars Surface; Three Dimensional Models; Pattern Registration; Autonomy

20040012803 Elorete Corp., Moffett Field, CA, USA

Simulation of Prebiotic Processing by Comet and Meteoroid Impact: Implications for Life on Early Earth and Other Planets

Dateo, Christopher E.; [2003]; 1 pp.; In English; ACS: Honoring Innovators and Pioneers in Aviation and the Atmosphere, Earth's Atmosphere and Beyond, 25 Oct. 2003, Menlo Park, CA, USA

Contract(s)/Grant(s): NAS2-00062; No Copyright; Avail: Other Sources; Abstract Only

We develop a reacting flow model to simulate the shock induced chemistry of comets and meteoroids entering planetary atmospheres. Various atmospheric compositions comprising of simpler molecules (i.e., CH₄, CO₂, H₂O, etc.) are investigated to determine the production efficiency of more complex prebiotic molecules as a function of composition, pressure, and entry velocity. The possible role of comets and meteoroids in creating the inventory of prebiotic material necessary for life on Early Earth is considered. Comets and meteoroids can also introduce new materials from the Interstellar Medium (ISM) to planetary atmospheres. The ablation of water from comets, introducing the element oxygen into Titan's atmosphere will also be considered and its implications for the formation of organic and prebiotic material.

Author

Computerized Simulation; Hypervelocity Impact; Meteoroids; Comets; Earth (Planet); Extraterrestrial Life

20040012964 NASA Goddard Space Flight Center, Greenbelt, MD, USA

X-ray Haloes and Scattering by Interstellar Grains

Dwek, Eliahu; [2003]; 1 pp.; In English; Astrophysics of Dust Conference, 26-30 May 2003, Estes Park, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

The presence of dust in the general interstellar medium is inferred from the general extinction of starlight, the diffuse infrared emission, and the elemental abundance constraints. X-ray haloes around X-ray sources, produced by small angle scattering from intervening interstellar dust particles provide a new probe into the nature of interstellar dust. In this talk I will review the physics of X-ray scattering by dust particles, and present an analysis of dust properties around select X-ray sources.

Author

Interstellar Matter; Cosmic Dust; Halos; X Ray Sources

92

SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20040010570 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Genesis Mission: An Overview

Space Science Reference Guide, 2nd Edition; [2003]; 1 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the scientists studying the formation of planets is Don Burnett, principal investigator of the Genesis mission. He designed a NASA project to collect a sample of solar material that may help scientists answer important and puzzling questions. In August 2002, NASA launched the Genesis spacecraft. The spacecraft is not a time machine; it cannot go back to the time of formation of the solar system. What it will do is the next best thing. The Genesis spacecraft will journey toward the sun. It will go to a place outside the Earth's magnetic field where the Earth and sun gravities are balanced. While in orbit, the spacecraft will bathe in solar wind that is flung out from the sun. Solar wind particles are similar to material from which the planets formed, and are atoms, ions, or high-energy particles.

Derived from text

Genesis Mission; Sample Return Missions

20040010577 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Genesis Solar Wind Sample Return Mission

Wiens, Roger C.; Burnett, Donald S.; Neugebauer, Marcia; Sasaki, Chester; Sevilla, Donald; Stansbery, Eileen; Clark, Ben; Smith, Nick; Oldham, Lloyd, et al.; Space Science Reference Guide, 2nd Edition; [2003]; 11 pp.; In English; See also 20040010556; Original contains color illustrations

Contract(s)/Grant(s): JPL-19272; Copyright; Avail: CASI; [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Genesis spacecraft was launched on August 8 from Cape Canaveral on a journey to become the first spacecraft to return from interplanetary space. The fifth in NASA's line of low-cost Discovery-class missions, its goal is to collect samples of solar wind and return them to Earth for detailed isotopic and elemental analysis. The spacecraft is to collect solar wind for over two years, while circling the L1 point 1.5 million km sunward of the earth, before heading back for a capsule-style re-entry in September, 2004. After parachute deployment, a mid-air helicopter recovery will be used to avoid a hard landing. The mission has been in the planning stages for over ten years. Its cost, including development, mission operations, and sample analysis, is approximately \$209M. The Genesis science team, headed by principal investigator Donald Burnett of Caltech, consists of approximately 20 co-investigators from universities and science centers around the country and internationally. The spacecraft consists of a relatively flat spacecraft bus containing most of the subsystem components, situated below a sample return capsule (SRC) which holds the solar-wind collection substrates and an electrostatic solar wind concentrator. Some of the collectors are exposed throughout the collection period, for a sample of bulk solar wind, while others are exposed only to certain solar wind regimes, or types of flow. Ion and electron spectrometers feed raw data to the spacecraft control and data-handling (C&DH) unit, which determines ion moments and electron flux geometries in real time. An algorithm is used to robotically decide between interstream (IS), coronal hole (CH), and coronal mass ejection (CME) regimes, and to control deployment of the proper arrays to sample these wind regimes independently. This is the first time such a solar-wind decision algorithm has been used on board a spacecraft.

Author

Genesis Mission; Sample Return Missions; Solar Wind

20040010590 NASA Johnson Space Center, Houston, TX, USA

Genesis Discovery Mission: Science Canister Processing at JSC

Stansbery, E. K.; Cyr, K. E.; Allton, J. H.; Schwarz, C. M.; Warren, J. L.; Schwandt, C. S.; Hittle, J. D.; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; Lunar and Planetary Science XXXII, 2001, USA; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Genesis addresses questions about materials and processes involved in the origins of the solar system by providing precise knowledge of solar isotopic and elemental compositions. Solar wind ions are collected and returned to Earth for analyses. The spacecraft has two primary instruments to collect solar wind: a set of collector arrays each of which can deploy to sample different solar wind regimes, and a concentrator that is an electrostatic mirror to concentrate and focus low mass ions onto a 6 cm target. One of the key challenges to obtaining a good sample of solar wind, uncontaminated by terrestrial atoms, is to have clean collection surfaces in a clean sample canister and clean facilities to handle the samples for allocation and future reference. The Johnson Space Center (JSC) is responsible for contamination control for the mission, for ensuring the cleanliness of collection surfaces, and for providing a clean environment for handling of the samples. The level of cleanliness required is high; at the time of analysis (after sample return), the surface contamination by C, N, O must each be $<10(\exp 15)$ atoms/sq cm and for other elements the number of atoms/sq cm of each surface contaminant shall not exceed the estimated solar wind fluence of the species (varies by element between U at approx. $10(\exp 4)$ atoms/sq cm to Fe, Si, Mg, and Ne at approx. $10(\exp 12)$ atoms/sq cm).

Author

Chemical Composition; Solar System; Solar Wind; Isotopic Labeling; Sample Return Missions

20040010591 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Genesis Solar-Wind Sample Return Mission: The Materials

Jurewicz, A. J. G.; Burnett, D. S.; Wiens, R. C.; Woolum, D.; Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; Lunar and Planetary Science XXXI, USA; See also 20040010556; Original contains black and white illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Genesis spacecraft has two primary instruments which passively collect solar wind. The first is the collector arrays, a set of panels, each of which can deploy separately to sample the different kinds of solar wind (regimes). The second is the concentrator, an electrostatic mirror which will concentrate ions of mass 4 through mass 25 by about a factor of 20 by focusing them onto a 6 cm diameter target. When not deployed, these instruments fit into a compact canister. After a two year exposure time, the deployed instruments can be folded up, sealed into the canister, and returned to earth for laboratory analysis. Both the collector arrays and the concentrator will contain suites of ultra-high purity target materials, each of which is tailored to enable the analysis of a different family of elements. This abstract is meant to give a brief overview of the Genesis mission, insight into what materials were chosen for flight and why, as well as head s up information as to what will be available to planetary scientist for analysis when the solar-wind samples return to Earth in 2003. Earth. The elemental and isotopic

abundances of the solar wind will be analyzed in state-of-the-art laboratories, and a portion of the sample will be archived for the use of future generations of planetary scientists. Technical information about the mission can be found at www.gps.caltech.edu/genesis.

Author

Sample Return Missions; Genesis Mission; Electrostatics; Solar Wind

20040012652 NASA Marshall Space Flight Center, Huntsville, AL, USA

Coronal Heating, Spicules, and Solar-B

Moore, Ron; Falconer, David; Porter, Jason; Hathaway, David; Yamauchi, Yohei; [2003]; 1 pp.; In English; Fifth Solar B-Science Meeting, 14- Nov. 2003, Tokyo, Japan; No Copyright; Avail: Other Sources; Abstract Only

Falconer et al. investigated the heating of the quiet corona by measuring the increase of coronal luminosity with the amount of the magnetic flux in the underlying network at solar minimum when there were no active regions on the face of the Sun. The coronal luminosity was measured from Fe IX/X - Fe XII pairs of coronal images from SOHO/EIT, under the assumption that practically all of the coronal luminosity in these very quiet regions came from plasma in the temperature range $0.9 \times 10^{(exp 6)} \text{ K}$ is less than or equal to T is less than or equal to $1.3 \times 10^{(exp 6)} \text{ K}$. The network magnetic flux content was measured from SOHO/MDI magnetograms. It was found that luminosity of the corona in these quiet regions increased roughly in proportion to the square root of the magnetic flux content of the network and roughly in proportion to the length of the perimeter of the network flux clumps. From 1) this result; 2) the observed occurrence of many fine-scale explosive events (e.g., spicules) at the edges of network flux clumps; and 3) a demonstration that it is energetically feasible for the heating of the corona in quiet regions to be driven by explosions of granule-sized sheared-core magnetic bipoles embedded in the edges of the network flux clumps, Falconer et al. infer that in quiet regions that are not influenced by active regions the corona is mainly heated by such magnetic activity in the edges of the network flux clumps. From their observational results together with their feasibility analysis, Falconer et al. predict that 1) At the edges of the network flux clumps there are many transient sheared core bipoles of the size and lifetime of granules and having transverse field strengths greater than approx. 100 G; 2) Approx. 30 of these bipoles are present per supergranule; and 3) Most spicules are produced by explosions of these bipoles. The photospheric vector magnetograms, chromospheric filtergrams, and EUV spectra from Solar-B are expected to have sufficient sensitivity, spatial resolution, and cadence to test these predictions. The Falconer et al. (2003) inferred mixed-polarity magnetic flux at the base of spicules is compatible with the observed magnetic structure of Ha macrospicules recently found by Yamauchi et al. (2003).

Author

Solar Corona; Solar Activity; Spicules; Heating

20040012679 NASA Marshall Space Flight Center, Huntsville, AL, USA

Eruption of a Multiple-Turn Helical Magnetic Flux Tube in a Large Flare: Evidence for External and Internal Reconnection that Fits the Breakout Model of Solar Magnetic Eruptions

Gary, G. Allen; Moore, R. L.; [2003]; 2 pp.; In English; No Copyright; Avail: CASI; [A01](#), Hardcopy

We present observations and an interpretation of a unique multiple-turn spiral flux tube eruption from AR10030 on 2002 July 15. The TRACE CIV observations clearly show a flux tube that is helical and that is erupting from within a sheared magnetic field. These observations are interpreted in the context of the breakout model for magnetic field explosions. The initiation of the helix eruption starts 25 seconds after the peak of the flare's strongest impulsive spike of microwave gyrosynchrotron radiation early in the flare's explosive phase, implying that the sheared core field is not the site of the initial reconnection. Within the quadrupolar configuration of the active region, the external and internal reconnection sites are identified in each of two consecutive eruptive flares that produce a double CME. The first external breakout reconnection apparently releases an underlying sheared core field and allows it to erupt, leading to internal reconnection in the wake of the erupting helix. This internal reconnection heats the two-ribbon flare and might or might not produce the helix. These events lead to the first CME and are followed by a second breakout that initiates a second and larger halo CME. The strong magnetic shear in the region is associated with rapid proper motion and evolution of the active region. The multiple-turn helix originates from above a sheared-field magnetic inversion line within a filament channel, and starts to erupt only after fast breakout reconnection has started. These observations are counter to the standard flare model and support the breakout model for eruptive flare initiation. However, the observations are compatible with internal reconnection in a sheared magnetic arcade in the formation and eruption of the helix.

Author

Coronal Mass Ejection; Magnetic Flux; Halos; Solar Magnetic Field; Magnetic Field Reconnection; Solar Flares

20040012775 NASA Goddard Space Flight Center, Greenbelt, MD, USA

SORCE and Future Satellite Observations of Solar Irradiance

Cahalan, Robert F.; Rottman, G.; Woods, T.; Lawrence, G.; Kopp, G.; Harder, J.; McClintock, W.; [2003]; 1 pp.; In English; IGARSS 2003, 21-25 Jul. 2003, Toulouse, France; Copyright; Avail: Other Sources; Abstract Only

With solar activity just passing the maximum of cycle 23, SORCE is beginning a 5 year mission to measure total solar irradiance (TSI) with unprecedented accuracy using phase-sensitive detection, and to measure spectral solar irradiance (SSI) with unprecedented spectral coverage, from 1 to 2000 nm. The new Total Irradiance Monitor (TIM) has 4 active cavity radiometers, any one of which can be used as a fixed-temperature reference against any other that is exposed to the Sun via a shutter that cycles at a rate designed to minimize noise at the shutter frequency. The new Spectral Irradiance Monitor (SIM) is a dual Fery prism spectrometer that can employ either prism as a monochromatic source on the other prism, thus monitoring its transmission during the mission lifetime. Either prism can measure SSI from 200 to 2000 nm, employing the same phase-sensitive electrical substitution strategy as TIM. SORCE also carries dual SOLSTICE instruments to cover the spectral range 100-320 nm, similar to the instruments onboard UARS, and also an XUV Photometer System (XPS) similar to that on TIMED. SSI has now been added to TSI as a requirement of EOS and NPOESS, because different spectral components drive different components of the climate system - UV into upper atmosphere and stratospheric ozone, IR into tropospheric water vapor and clouds, and Visible into the oceans and biosphere. Succeeding satellite missions being planned for 2006 and 2011 will continue to monitor these critical solar variables.

Author

Irradiance; Satellite Observation; Solar Radiation; Space Missions; Solar Spectra

20040012781 Communications Research Lab., Japan

Solar and Solar Wind: Energy Build-up Study of Solar Flares

Kurokawa, Hiroki; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 3-12; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

This paper demonstrates which type of sunspot groups or changes in the magnetic field configuration produce strong solar flares by showing results obtained during international coordinated observations in June, 2000.

Derived from text

Solar Flares; Magnetic Field Configurations

20040012782 Communications Research Lab., Japan

Solar and Solar Wind: High Energy Particle Acceleration in the Heliosphere

Oka, Mitsuo; Terasawa, Toshio; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 13-19; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

Recent studies have revealed that the cause of high energy particles associated with solar flares is deeply related to the interplanetary shocks originated from the eruptive phenomena. Investigations of particle acceleration in interplanetary space have also contributed to the elucidation of the origin of the high energy cosmic particles. Topics from interplanetary observations are presented.

Author

Interplanetary Space; Particle Acceleration

20040012789 Communications Research Lab., Japan

Solar and Solar Wind: Solar Wind and Interplanetary Disturbances

Watari, Shinichi; Review of the Communications Research Laboratory, Volume 48, No. 3; September 2002, pp. 21-35; In Japanese; See also 20040012780; Copyright; Avail: Other Sources

Basic knowledge of solar wind and interplanetary disturbances are described. Recent results from new observations and theories are presented. Research activities to predict disturbances for weather forecasting are discussed.

Author

Solar Wind; Coronal Mass Ejection

20040012998 Communications Research Lab., Tokyo, Japan

Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3

Igarashi, Kiyoshi, Editor; Tomita, Fumihiko, Editor; Yoshimoto, Shigetoshi, Editor; Kikuchi, Takashi, Editor; Miyake, Wataru,

Editor; September 2002; ISSN 0914-9260; 177 pp.; In English; See also 20040012999 - 20040013010; Copyright; Avail: Other Sources

The following reports are included on this database from the Journal of Communications Research Laboratory: Space Weather and its Hazards on the High-Tech System; Study of Energy Build-up in Solar Flares; High-Energy Particle Acceleration in the Heliosphere; Solar Wind and Interplanetary Disturbances; Interplanetary Magnetic Flux Ropes; Formation of the Magnetosphere and Magnetospheric Plasma Regime; Generation of Convection in the Magnetosphere-Ionosphere Coupling System; Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field; Transmission Line Model for Ground Magnetic Disturbances; Geomagnetic Storms; Space Weather Research with Computer Simulations; and Ionospheric Irregularities.

CASI

Magnetic Storms; Space Weather; Solar Wind; Solar Flares

20040013000 Communications Research Lab., Tokyo, Japan

Space Weather and its' Hazards on the High-Tech System

Kikuchi, Takashi; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 1-3; In English; See also 20040012998; Copyright; Avail: Other Sources

A summary is given of various space weather phenomena observed at points lying between the Sun and the ionosphere and the hazards experienced by satellites and ground-based facilities associated with them.

Derived from text

Space Weather; Magnetic Storms

20040013001 Kyoto Univ., Japan

Study of Energy Build-up in Solar Flares

Kurokawa, Hiroki; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 5-15; In English; See also 20040012998; Copyright; Avail: Other Sources

To guarantee human beings to work safely and effectively in the space, the forecast for strong solar flares is indispensable. And the study of the build-up and release mechanism of the magnetic field energy, which is the source of flares, is essentially needed. This paper demonstrates which type of sunspot groups or which type of changes in the magnetic field configuration produce strong flares by showing the results obtained during the international coordinated observations in June, 2000. Our important finding is the fact that strong flares occurred right after the emergence of a strongly-twisted magnetic flux rope. We stress, therefore, the importance of further quantitative analyses of the evolution of the twisted magnetic flux rope in more details, and the importance of continuous solar observations from the space to develop the space weather research.

Author

Space Weather; Solar Flares

20040013002 Communications Research Lab., Japan

Solar Wind and Interplanetary Disturbances

Watari, Shinichi; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 25-40; In English; See also 20040012998; Copyright; Avail: Other Sources

This report describes basic knowledge of solar wind and interplanetary disturbances first, and then it discussed recent results from new observations and theories. At the end it presented research activities to predict interplanetary disturbances for space weather forecast.

Author

Solar Wind; Space Weather; Coronal Mass Ejection; Interplanetary Magnetic Fields

20040013004 Communications Research Lab., Japan

Geomagnetic Storms

Nagatsuma, Tsutomu; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 139-154; In English; See also 20040012998; Copyright; Avail: Other Sources

Geomagnetic storms, in which the global geomagnetic field intensity decreases on the order of tens to hundreds nT, are phenomena that occur on the largest scale in the solar wind-magnetosphere-ionosphere coupled system. Geomagnetic storms develop when solar wind-magnetosphere couplings are intensified by solar wind disturbances (coronal holes and CME phenomena) that accompany southward IMF. Perturbations in the magnetic field are caused by geomagnetic storms and can be explained by the westward electric current along the geomagnetic equator (ring current). Such perturbations on the scale of $10(\exp 15) - 10(\exp 16)$ J occur when the magnetosphere responds to the injections of energy during geomagnetic storms. Geomagnetic storms are generally believed to develop in association with an increase in magnetospheric convection. However, in contrast to magnetospheric convection development (which is saturated with strong solar wind electric fields), analysis of the correlation of solar wind parameters to magnetospheric convection and to geomagnetic storms has revealed that geomagnetic storm growth is not saturated with such electric fields. This indicates that geomagnetic field growth and magnetospheric convection growth may not correlate perfectly.

Author

Geomagnetism; Magnetic Storms; Solar Wind; Magnetospheric Instability; Ionospheric Currents; Electric Fields

20040013006 Communications Research Lab., Japan

Interplanetary Magnetic Flux Ropes

Marubashi, Katsuhide; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 41-57; In English; See also 20040012998; Copyright; Avail: Other Sources

The purpose of this review is to examine the possibility of predicting large geomagnetic storms from solar observations. We focus on three topics: (1) the relationship between coronal magnetic fields and interplanetary magnetic flux ropes, (2) the role of magnetic flux ropes in geomagnetic storms, and (3) further studies needed for improving our ability to predict geomagnetic storms based on our knowledge of interplanetary magnetic flux ropes. Evidence is presented that the magnetic structures of magnetic flux ropes are strongly controlled by large-scale magnetic fields in the solar source regions of coronal mass ejections. The relationship suggests the possibility of predicting the variations in interplanetary magnetic fields based on solar observations at the time of launch of coronal mass ejections. An analysis of one particular geomagnetic storm reveals the necessity of further precise knowledge on the global topology of flux ropes in interplanetary space. Finally, we suggest some important problems to be studied in the future.

Author

Solar Magnetic Field; Magnetic Storms; Coronal Mass Ejection

20040013007 Communications Research Lab., Japan

Formation of the Magnetosphere and Magnetospheric Plasma Regime

Obara, Takahiro; Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards, Volume 49, No. 3; September 2002, pp. 61-74; In English; See also 20040012998; Copyright; Avail: Other Sources

The Earth's magnetosphere is formed by the plasma flow from the Sun; i.e. solar wind. This solar wind particle can enter the magnetosphere through non-MHD processes and produces specific regions of plasma. This is due to the convection motion seen in the magnetosphere. An enhancement of the magnetospheric convection causes storms and substorms in the magnetosphere. Highly energetic particles can be produced through very efficient acceleration processes during the storms. In this paper we describe the fundamental physics of the magnetosphere, aiming a transition of researches to the Space Weather forecast.

Author

Earth Magnetosphere; Storms; Magnetohydrodynamic Flow; Solar Wind; Space Plasmas

20040013012 NASA Goddard Space Flight Center, Greenbelt, MD, USA

RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare

Gallagher, Peter T.; Dennis, Brian R.; Krucker, Saem; Schwartz, Richard A.; Tolbert, A. Kimberly; August 22, 2002; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Observations of the X1.5 flare on 21 April 2002 are reviewed using the Ramaty High Energy Solar Spectroscopic Imager (RHESSI) and the Transition Region and Coronal Explorer (TRACE). The major findings are as follows: 1. The 3-25 keV X-rays started 54 mins before the EUV (195 Å) emission suggesting that the initial energy release heated plasma directly to 220 MK, well above the 1.6 MK needed to produce the Fe XII (195 Å) line. 2. Using coaligned 12-25 keV RHESSI and

TRACE images, further evidence is found for the existence of hot (15-20 MK) plasma in the 195 Å passband. This hot, diffuse emission is attributed to the presence of the Fe XXIV (192 Å) line within the TRACE 195 Å passband. 3. The 12-25 keV source centroid moves away from the limb with an apparent velocity of approx. 9.9 km/s, slowing to approx. 1.7 km/s after 3 hours, its final altitude being approx. 120 Mm after approx. 12 hours. This suggests that the energy release site moves to higher altitudes in agreement with classical flare models. 4. The 50-100 keV emission correlates well with EUV flare ribbons, suggesting thick-target interactions at the footpoints of the magnetic arcade. The 50-100 keV time profile matches the time derivative of the GOES light curve (Neupert effect), which suggests that the same electrons that produced the thick-target hard X-ray emission also heat the plasma seen in soft X-rays. 5. X-ray footpoint emission has an E(sup -3) spectrum down to approx. 10 keV suggesting a lower electron cutoff energy than previously thought. 6. The hard X-ray (25-200 keV) peaks have FWHM durations of approx. 1 min suggesting a more gradual energy release process than expected. 7. The TRACE images reveal a bright symmetric front propagating away from the main flare site at speeds of greater than or = 120 km/s. This may be associated with fast CME observed several minutes later by LASCO. 8. Dark sinuous lanes are observed in the TRACE images that extend almost radially from the post-flare loop system. This 'fan of spines' becomes visible well into the decay phase of the flare and shows evidence for both lateral and downward motions.

Author

Solar Transition Region; Spectroscopy; Emission; Extreme Ultraviolet Radiation; Transition Region and Coronal Explorer

93

SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see *52 Aerospace Medicine*. For theory see *73 Nuclear Physics*.

20040010588 Lunar and Planetary Inst., Houston, TX, USA

What is the Electromagnetic Spectrum? What is Infrared? How was the Infrared Discovered?

Space Science Reference Guide, 2nd Edition; [2003]; 2 pp.; In English; See also 20040010556; Original contains color illustrations; Copyright; Avail: CASI; [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Light (or radiation) is made up of vibrating waves of electrical and magnetic fields. This is where the term electromagnetic radiation comes from. Electromagnetic radiation travels in waves which have different wavelengths, energies and frequencies. The wavelength is the distance between individual waves (e.g. from one peak to another). The frequency is the number of waves which pass a point in space each second. Light waves are waves of energy and the amount of energy in a wave is proportional to its frequency. Wavelength increases, while frequency and energy decreases as we go from gamma rays to radio waves. All electromagnetic radiation travels at the speed of light (186,000 miles or 300,000,000 meters per second in a vacuum). When we look at the world around us we are seeing visible light waves (or visible radiation). However, there are many other forms of radiation that we cannot see with our eyes. These types include gamma rays, x-rays, ultraviolet, infrared, microwaves and radio waves. Together with visible light, all these types of radiation make up what we call the electromagnetic spectrum, the complete spectrum of radiation.

Author

Electromagnetic Radiation; Light (Visible Radiation); Infrared Radiation; Electric Fields; Magnetic Fields

99

GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20040008893 NASA Stennis Space Center, Bay Saint Louis, MS, USA

Oxygen: Not Just for Breathing Anymore

Yentzen, Michael J.; November 1998; 10 pp.; In English

Report No.(s): IS-1998-08-00002-SSC; No Copyright; Avail: CASI; [A02](#), Hardcopy

A brief discussion of the modern oxygen industry is presented. The journey from the past one hundred years to today's

oxygen production industry involved such diverse subjects as the Paris theater, the brewing industry, explosives, and the ASTM Committee G-4.

Author

Oxygen Production; Industrial Safety

20040010394 NASA Langley Research Center, Hampton, VA, USA

Crafting Flight: Aircraft Pioneers and the Contributions of the Men and Women of NASA Langley Research Center

Schultz, James; [2003]; 244 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/SP-2003-4316; LC-2002-026358; No Copyright; Avail: CASI; [A11](#), Hardcopy

While this is a self-contained history of NASA Langley Research Center's contributions to flight, many other organizations around the country played a vital role in the work described in this book. When you pass through the front gates of NASA Langley Research Center you are entering an extraordinary place. You could easily miss that fact, however. A few years cross-state bicycle tour passed through the Center. As interesting as looping around Center was, the riders observed that nothing about the vaguely industrial site fit the conventional stereotypes of what high tech looks like. NASA Langley does not fit many stereotypes. It takes a close examination to discover the many ways it has contributed to development of flight. As part of the national celebrations commemorating the 100th anniversary of the Wright brothers first flight, James Schultz, an experienced journalist with a gift for translating the language of engineers and scientists into prose that nonspecialists can comprehend, has revised and expanded *Winds of Change*, his wonderful guide to the Center. This revised book, *Crafting Flight*, invites you inside. You will read about one of the Nation's oldest research and development facilities, a place of imagination and ingenuity.

Derived from text

NASA Programs; Aerospace Engineering; Aeronautical Engineering

20040010705 National Inst. of Standards and Technology, Gaithersburg, MD

Journal of Research of the National Institute of Standards and Technology, May-June 2003. Volume 108, No. 3

Jun. 30, 2003; 96 pp.; In English

Report No.(s): PB2004-102463; No Copyright; Avail: CASI; [A05](#), Hardcopy

The report contains articles on: Amorphous Calcium Phosphate-Based Bioactive Polymeric; Composites for Mineralized Tissue Regeneration; An Experimental Method for Measuring Mechanical Properties of Rat Pulmonary Arteries Verified With Latex; Dependence of Electron Density on Fermi Energy in N-Type; Gallium Antimonide; Radiometric Measurement Comparison on the Integrating; Sphere Source Used to Calibrate the Moderate Resolution; Imaging Spectroradiometer (MODIS) and the Landsat 7; Enhanced Thematic Mapper Plus (ETM+); Relating Fresh Concrete Viscosity Measurements From Different Rheometers; and Repeatability and Reproducibility Standard Deviations in the Measurement of Trace Moisture Generated Using Permeation Tubes. It also contains News Briefs on various subjects.

NTIS

Measuring Instruments; Medical Science; Composite Materials

Subject Term Index

ABLATION

Neoadjuvant Anti-Angiogenesis Therapy for Prostate Cancer – [127](#)

ABSORBERS (MATERIALS)

Instrumentation Facility for the Evaluation of Photonic and Opto-Electronic Materials – [59](#)

ABSORPTION SPECTROSCOPY

Spectroscopy-Based Characterization of Single Wall Carbon Nanotubes – [46](#)

ABSORPTION

Lithium-Based Electrochromic Mirrors – [39](#)

ACCELERATION (PHYSICS)

Supernovae and the Accelerating Universe – [217](#)

ACCELEROMETERS

Precision Structural Mechanics Instrumentation System – [157](#)

ACCEPTOR MATERIALS

Biological Controls on the Precipitation of Chromium in Harbor Sediments – [33](#)

Dietary Methionine Restriction: Novel Treatment for Hormone Independent Prostate Cancer – [111](#)

ACCRETION DISKS

Probing the Inflow/Outflow and Accretion Disk of Cygnus X-1 in the High State with the Chandra High Energy Transmission Grating – [216](#)

Ring Around the Black Hole – [229](#)

Variability of Accretion Flow in the Core of the Seyfert Galaxy NGC 4151 – [218](#)

ACCUMULATORS

Spreadsheet Accumulator Sizing for Hybrid Hydraulic Applications Using the Benedict-Webb-Rubin Equation of State – [64](#)

ACCURACY

High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures – [65](#)

ACOUSTIC MEASUREMENT

Instrumentation and Equipment Upgrades to Improve Acoustical and Fluid Dynamic Measurements in the Garfield Thomas Water Tunnel – [48](#)

ACOUSTIC PROPERTIES

Experimental Characterization of Coherent, Radially-Sheared Zonal Flows in the DIII-D Tokamak – [63](#)

ACOUSTIC VELOCITY

Reversing Flows and Heat Spike: Caused by Solar g-Modes? – [76](#)

ACOUSTICS

Signal Processing for Acoustic Communications in Underwater Channels using Quadrature Amplitude Modulation – [50](#)

ACQUISITION

Information Technology: Architecture Needed to Guide NASA's Financial Management Modernization – [15](#)

ADAPTIVE CONTROL

From Materials to Missions Assess-Predict-Optimize: A Computational Approach to Adaptive Design – [161](#)

Human Performance Effects of Adaptive Automation of Various Air Traffic Control Information Processing Functions – [9](#)

Real-Time Adaptive Control of Flow-Induced Cavity Tones – [62](#)

ADHESION

Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0004: Advanced Sol-Gel Adhesion Processes – [44](#)

The Role of S100A7/RANBPM Interaction in Human Breast Cancer – [117](#)

ADHESIVE BONDING

Role of E-Cadherin Homophilic Contacts in the Inhibition of Cell Growth of Primary Breast Cells – [129](#)

ADIABATIC CONDITIONS

Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – [70](#)

ADIABATIC DEMAGNETIZATION COOLING

A 10 Kelvin Magnet for Space-Flight ADRs – [210](#)

ADSORPTION

Temperature Swing Adsorption Compressor Development – [74](#)

AEROACOUSTICS

Ultra High Bypass Ratio Low Noise Engine Study – [12](#)

AERODYNAMIC CHARACTERISTICS

An Experimental and Computational Study of the Aerodynamics of a Square Cross-Section Body at Supersonic Speeds – [160](#)

Technical Evaluation Report, Part A - Vortex Flow and High Angle of Attack – [5](#)

Unsteady Aerodynamic Model for Thin Wings With Evolutive Vortex Sheets – [4](#)

Unsteady Flows and Airfoil-Vortex Interaction – [6](#)

AERODYNAMIC CONFIGURATIONS

Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – [6](#)

AERODYNAMIC HEATING

Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – [206](#)

AERODYNAMIC LOADS

Investigation of the IEC Safety Standard for Small Wind Turbine Design through Modeling and Testing – [2](#)

AERODYNAMICS

Design Issues Associated with Full-Scale Application of Active Control of Vortex Flows – [8](#)

Projectile Aerodynamic Jump Due to Lateral Impulsives – [3](#)

AEROELASTICITY

A New Modular Approach for Tightly Coupled Fluid/Structure Analysis – [63](#)

Annual Report 2002 on FOI's Research on Air Vehicles (FOT 25) – [2](#)

Demonstration of the Ability of RCAS to Model Wind Turbines – [2](#)

Investigation of the IEC Safety Standard for Small Wind Turbine Design through Modeling and Testing – [2](#)

AERONAUTICAL ENGINEERING

Crafting Flight: Aircraft Pioneers and the Contributions of the Men and Women of NASA Langley Research Center – [243](#)

AEROSAT SATELLITES

Remote Sensing of Aerosol using MODIS, MODIS+CALIPSO and with the AEROSAT Concept – [97](#)

AEROSOLS

A Downscaling Analysis of the Urban Influence on Rainfall: TRMM Satellite Component AMS Conference on Satellite Meteorology and Oceanography – [98](#)

Aerosol Attenuation Model for Scandinavian Environment: Based on Measurements at Loevsætra in Uppland – [138](#)

Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – [88](#)

Remote Sensing of Aerosol using MODIS, MODIS+CALIPSO and with the AEROSAT Concept – [97](#)

AEROSPACE ENGINEERING

Baseline Testing of the Club Car Carryall With Asymmetric Ultracapacitors – [53](#)

Crafting Flight: Aircraft Pioneers and the Contributions of the Men and Women of NASA Langley Research Center – [243](#)

The Laboratory for Terrestrial Physics – [208](#)

AEROSPACE INDUSTRY

Annual Report 2002 on FOI's Research on Air Vehicles (FOT 25) – [2](#)

AEROSPACE MEDICINE

Cognitive Measures of Vietnam-Era Prisoners of War – [131](#)

Hangtian Yixue Yu Yixue Gongscheng)
Volume 16, Number 5, October
2003 – 16

AEROSPACE SCIENCES

Essential Autonomous Science Inference
on Rovers (EASIR) – 235

Fuel Cells for Space Science Applica-
tions – 79

SOFIA First Generation Science Instru-
ments – 68

The Laboratory for Terrestrial Phys-
ics – 208

AEROSPACE SYSTEMS

Business Modernization: Disciplined Pro-
cesses Needed to Better Manage
NASA's Integrated Financial Manage-
ment Program – 15

Center of Excellence in Space Data and
Information Sciences – 207

Conceptual Design of In-Space Vehicles
for Human Exploration of the Outer Plan-
ets – 17

Overview of Non-nuclear Testing of the
Safe, Affordable 30-kW Fission Engine,
Including End-to-End Demonstrator Test-
ing – 22

AEROSPACE TECHNOLOGY TRANSFER

ST7-DRS: A Step Towards Drag-free and
High-precision Formation Control – 19

AEROSPACE VEHICLES

A New Modular Approach for Tightly
Coupled Fluid/Structure Analysis – 63

AFRICA

Prostate Cancer in Nigerians, Jamaicans
and U.S. Blacks – 205

AGGREGATES

The First Rock in the Solar Sys-
tem – 227

AGING (BIOLOGY)

Analysis of Apaf-1 and Caspase 9 in
Tumorigenesis – 108

AGING (MATERIALS)

Ageing Control Number 3 of Propellants
for Rocket Motors RB 75 Maverick – 46

AIR BREATHING ENGINES

Exhaust Simulation Testing of a Hyper-
sonic Airbreathing Model at Transonic
Speeds – 13

AIR CONDITIONING

Antimicrobial Surface Treatments of Alu-
minium in Air Conditioning Systems – 43

AIR FLOW

Numerical Modelling of Vortex Flow In-
stabilities and Interactions – 8

Simulation of Wind-Induced Vortex Flow
and the Effect on a Helicopter Structural
Failure – 3

AIR POLLUTION

Application of the Models-3 Community
Multi-Scale Air Quality (CMAQ) Model
System to SOS/Nashville 1999 – 84

Example Moisture Mass Balance Calcu-
lations for Bioreactor Landfills – 83

Initial Screening of Thermochemical
Water-Splitting Cycles for High Efficiency
Generation of Hydrogen Fuels Using
Nuclear Power – 32

National Emission Standards for Hazard-
ous Air Pollutants Surface Coating of
Metal Cans. Background Information for
Final Standards. Summary of Public
Comments and Responses – 83

Restricting the Use of Reverse Thrust as
an Emissions Reduction Strategy (Re-
vised) – 85

AIR PURIFICATION

Temperature Swing Adsorption Com-
pressor Development – 74

AIR QUALITY

Performance Evaluation of CMAQ and
PM-CAMx for the July 1999 SOS Epi-
sode – 76

AIR TRAFFIC CONTROL

Human Performance Effects of Adaptive
Automation of Various Air Traffic Control
Information Processing Functions – 9

AIR TRANSPORTATION

Air Transportation Network Routing and
Scheduling – 9

AIRCRAFT APPROACH SPACING

Enabling CSPA Operations Through Pilot
Involvement in Longitudinal Approach
Spacing – 14

AIRCRAFT COMMUNICATION

Digital Avionics – 12

AIRCRAFT CONTROL

Vortex Flow Dilemmas and Control on
Wing Planforms on High Speed – 4

AIRCRAFT DESIGN

An Assessment of CFD Effectiveness for
Vortex Flow Simulation to Meet Prelimi-
nary Design Needs – 8

Military Vortices – 4

Optimum Climb to Cruise Noise Trajec-
tories for the High Speed Civil Trans-
port – 9

Upgradable Operational Availability
Forecasting Tool For the U.S. Navy P-3
Replacement Aircraft – 11

AIRCRAFT MAINTENANCE

Cooperative Multi-Agent Mobile Sensor
Platforms for Jet Engine Inspection: Con-
cept and Implementation – 159

AIRCRAFT MODELS

Effects of Various Fillet Shapes on a
76/40 Double Delta Wing from Mach 0.18
to 0.7 – 6

PC Desktop Aerodynamic Models for
Store Separation from Weapons Bay
Cavities and Related Vortical Pro-
cesses – 3

AIRCRAFT NOISE

Dynamic Measurement of the Operator
for Future System Development – 11

AIRCRAFT PERFORMANCE

Dynamic Measurement of the Operator
for Future System Development – 11

AIRCRAFT WAKES

Enabling CSPA Operations Through Pilot
Involvement in Longitudinal Approach
Spacing – 14

AIRFOILS

Unsteady Flows and Airfoil-Vortex Inter-
action – 6

AIRPORTS

Digital Avionics – 12

Restricting the Use of Reverse Thrust as
an Emissions Reduction Strategy (Re-
vised) – 85

ALGORITHMS

A Sounding Rocket Attitude Determina-
tion Algorithm Suitable for Implementa-
tion Using Low Cost Sensors – 161

Automated Data Processing as an AI
Planning Problem – 69

Differentially Variable Component Analy-
sis (dVCA): Identifying Multiple Evoked
Components using Trial-to-Trial Variabil-
ity – 162

EAGLE Monitors by Collecting Facts and
Generating Obligations – 148

Electrostatic Image Theory for Two Inter-
secting Conducting Spheres – 173

EOSDIS Project on High-Performance
I/O Techniques – 146

Highly Accurate Similar Case Retrieval
System for Call Centers Using Two-word
Linked Expressions – 203

Image Compression: Algorithms and Ar-
chitectures – 146

Most Advanced Wireless Technology in
Scotland Launched at EICC – 147

Ocean Primary Production Estimates
from Terra MODIS and Their Depen-
dency on Satellite Chlorophyll Alpha Al-
gorithms – 104

Plan-graph Based Heuristics for Confor-
mant Probabilistic Planning – 141

Real-Time Adaptive Control of Flow-
Induced Cavity Tones – 62

Three Leading Japanese Firms Jointly
Develop a New Encryption Technology:
Elliptic Curve Cryptosystem (ECDSA Sig-
nature) – 147

Use of Collocated KWAJEX Satellite, Air-
craft, and Ground Measurements for Un-
derstanding Ambiguities in TRMM Ra-
diometer Rain Profile Algorithm – 96

ALIGNMENT

LEGO: A Modular Approach to Accelera-
tor Alignment Data Analysis – 179

ALKANES

Characterization of Soluble Organic in
Produced Water – 35

ALUMINUM ALLOYS

Air Vehicle Technology Integration Pro-
gram (AVTIP). Delivery Order 0004: Ad-
vanced Sol-Gel Adhesion Pro-
cesses – 44

- Effect of Applied Pressure During Feeding of Critical Cast Aluminum Alloy Components with Particular Reference to Fatigue Resistance – 40
- ALUMINUM COATINGS**
Fe-Al Weld Overlay and High-Velocity Oxy-Fuel Thermal Spray Coatings for Corrosion Protection of Waterwalls in Fossil Fired Plants with Low NOx Burners – 34
- ALUMINUM NITRIDES**
Simulation of Transport Phenomena in Aluminum Nitride Single-Crystal Growth – 196
- ALUMINUM**
Antimicrobial Surface Treatments of Aluminium in Air Conditioning Systems – 43
- AMBIGUITY**
Use of Collocated KWAJEX Satellite, Aircraft, and Ground Measurements for Understanding Ambiguities in TRMM Radiometer Rain Profile Algorithm – 96
- AMINO ACIDS**
The Thiamin Pyrophosphate Motif – 132
- AMORPHOUS MATERIALS**
S-Shaped Magnetic Macroparticle Filter for Cathodic ARC Deposition – 44
- AMOUNT**
Quantitative Tests of ELMs as Intermediate n Peeling-Ballooning Modes – 192
- AMPLIFIERS**
Finite-Duration Seeding Effects in Powerful Backward Raman Amplifiers – 183
- ANALOG TO DIGITAL CONVERTERS**
Bistable Reflective Etalon (BRET) – 56
- ANALYSIS (MATHEMATICS)**
Logic Synthesis Avoiding State Space Explosion – 139
- ANGLE OF ATTACK**
An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack – 6
CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft – 3
Design Issues Associated with Full-Scale Application of Active Control of Vortex Flows – 8
Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings – 8
Military Vortices – 4
Model of Unsteady Aerodynamic Coefficients of a Delta Wing Aircraft at High Angles of Attack – 6
Technical Evaluation Report, Part A - Vortex Flow and High Angle of Attack – 5
- ANISOTROPY**
Growth Induced Magnetic Anisotropy in Crystalline and Amorphous Thin Films – 38
- High Anisotropy CoPtCrB Magnetic Recording Media – 172
- ANNIHILATION REACTIONS**
Measurement of the Tau Lepton Lifetime – 171
- ANODES**
Diagnostic Setup for Characterization of Near-Anode Processes in Hall Thrusters – 12
- ANTARCTIC REGIONS**
ICESat's Laser Measurements of Polar Ice, Atmosphere, Ocean, and Land – 103
Searching Antarctic Ice for Meteorites – 228
- ANTENNA ARRAYS**
Green Bank Telescope 290 to 395 MHz Feed Analysis and Modification for Operation in the 140 to 175 MHz Band – 60
Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstrator – 51
- ANTENNA FEEDS**
Green Bank Telescope 290 to 395 MHz Feed Analysis and Modification for Operation in the 140 to 175 MHz Band – 60
- ANTENNA RADIATION PATTERNS**
Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstrator – 51
- ANTIBODIES**
The Role of Myoepithelial Maspin in Breast Carcinoma Progression Diagnosis and Screening – 120
- ANTIMATTER**
Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – 200
- ANTIMONY**
Lithium-Based Electrochromic Mirrors – 39
- ANTIPARTICLES**
Inclusive Decays B arrow DX and B arrow D(*)X – 176
Search for Rare Charm Meson Decays at FNAL E791 – 169
- APERTURES**
A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188
- APOPTOSIS**
Analysis of Apaf-1 and Caspase 9 in Tumorigenesis – 108
Selection of Aptamers for CED-9/Bcl-2 Family Cell Death Regulators and Their Application in Study of Apoptosis Regulation and Drug Design for Breast Cancer – 107
- The Role of GADD34 (Growth Arrest and DNA Damage- Inducible Protein) in Regulating Apoptosis, Proliferation, and Protein Synthesis in Human Breast Cancer Cells – 115
- APPLICATIONS OF MATHEMATICS**
Multioject Robust Control of Nonlinear Systems via State Dependent Coefficient Representations and Applications – 162
- APPLICATIONS PROGRAMS (COMPUTERS)**
A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – 156
A Performance Evaluation of the Cray X1 for Scientific Applications – 156
Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications – 157
Performance Characteristics of the Multi-Zone NAS Parallel Benchmarks – 152
- APPROXIMATION**
Hybrid Discrete-Continuous Markov Decision Processes – 141
- ARCHAEOLOGY**
Use of IKONOS Data for Mapping Cultural Resources of Stennis Space Center, Mississippi – 79
- ARCHITECTURE (COMPUTERS)**
A Performance Evaluation of the Cray X1 for Scientific Applications – 156
An Expert System for the Development of Efficient Parallel Code – 152
Architectural Design for the Global Legal Information Network – 203
Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications – 157
Experimental Evaluation and Workload Characterization for High-Performance Computer Architectures – 139
Image Compression: Algorithms and Architectures – 146
Information Technology: Architecture Needed to Guide NASA's Financial Management Modernization – 15
Scoping Planning Agents With Shared Models – 160
- ARMED FORCES (UNITED STATES)**
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
- ARMED FORCES**
Annual Report 2002 on FOI:s Research on Modelling and Simulation – 140
Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – 128

AROMATIC COMPOUNDS

A Molecular Model for Repression of BRCA-1 Transcription by the Aryl Hydrocarbon Receptor – 105

ARRAYS

A Plan of Development for Detection Systems for Seismic and Infrasound Arrays – 87

The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59

ARTIFICIAL INTELLIGENCE

Expert Seeker: A People-Finder Knowledge Management System – 159

Scoping Planning Agents With Shared Models – 160

ARTIFICIAL SATELLITES

OSIRIS User Guide, 1st Edition – 173

ASTEROIDS

Cratering of the Moon – 231

Spectral Models of Kuiper Belt Objects and Centaurs – 216

ASTROMETRY

Measurement of Precision Geometric Distances to Three Anchor Points in the Local Universe – 67

ASTRONOMY

Presolar Grains of Star Dust: Astronomy Studied with Microscopes – 225

Supernovae and the Accelerating Universe – 217

The Center of the Galaxy – 214

The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – 215

Validation Report for the Celestial Background Scene Descriptor (CBSD) stellar Point Sources Model CBSKY4 – 211

ASTROPHYSICS

Development and Operations of the Astrophysics Data System – 219

Gamma-Ray Bursts and Cosmology – 224

Gamma-ray Polarimetry – 224

ASYMMETRY

Baseline Testing of the Club Car Carryall With Asymmetric Ultracapacitors – 53

Conjugate Auroral Imagery – 91

High Power Liquid Hydrogen Target for Parity Violation Experiments – 171

Probing the Inflow/Outflow and Accretion Disk of Cygnus X-1 in the High State with the Chandra High Energy Transmission Grating – 216

Search for Bs Mixing with Inclusive Lepton Events at SLD – 167

ATMOSPHERIC ATTENUATION

Aerosol Attenuation Model for Scandinavian Environment: Based on Measurements at Loevsætra in Uppland – 138

ATMOSPHERIC CHEMISTRY

Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – 88

ICESat: Ice, Cloud, and Land Elevation Satellite – 94

Performance Evaluation of CMAQ and PM-CAMx for the July 1999 SOS Episode – 76

ATMOSPHERIC CIRCULATION

Triggering of Convection – 100

ATMOSPHERIC CORRECTION

Derivation of a Tasseled Cap Transformation Based on Landsat 7 At-Satellite Reflectance – 15

ATMOSPHERIC GENERAL CIRCULATION MODELS

Factors Affecting the Latitudinal Location of the Intertropical Convergence Zone in a GCM – 91

Global Weather Prediction and High-End Computing at NASA – 101

ATMOSPHERIC MODELS

Aerosol Attenuation Model for Scandinavian Environment: Based on Measurements at Loevsætra in Uppland – 138

An Equation for Moist Entropy in a Precipitating and Icy Atmosphere – 102

Implementation of an Urban Canopy Parameterization in MM5 for Meso-Gamma-Scale Air Quality Modeling Applications – 95

Tagging Water Sources in Atmospheric Models – 102

Vorticity-Divergence Global Semi-Lagrangian Spectral Model for the Shallow Water Equations – 95

ATMOSPHERIC PHYSICS

INSPIRE – 222

ATMOSPHERIC SOUNDING

Monthly Report of the Meteorological Satellite Center: August 2003 – 94

Monthly Report of the Meteorological Satellite Center: July 2003 – 94

ATOMIC SPECTRA

Characterization of Soluble Organic in Produced Water – 35

ATROPHY

Alpha Synuclein in a Model of Multiple System Atrophy – 130

ATTITUDE (INCLINATION)

A Sounding Rocket Attitude Determination Algorithm Suitable for Implementation Using Low Cost Sensors – 161

What are the Causes of the Formation of the Sub-Alfvénic Flows at the High Latitude Magnetopause – 18

AUDIO FREQUENCIES

INSPIRE – 222

AUDITORY PERCEPTION

Mental Representation of Auditory Sources – 184

AUDITORY SIGNALS

Mental Representation of Auditory Sources – 184

AUGMENTATION

Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles – 21

AURORAS

Conjugate Auroral Imagery – 91

AUTONOMY

Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles – 21

Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation – 159

Essential Autonomous Science Inference on Rovers (EASIR) – 235

Mission Simulation Facility: Simulation Support for Autonomy Development – 160

Terrain Model Registration for Single Cycle Instrument Placement – 235

AVIONICS

Digital Avionics – 12

AWACS AIRCRAFT

E-3 In-Flight Acoustic Exposure Studies and Mitigation Via Active Noise Reduction Headset – 11

AXISYMMETRIC BODIES

An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack – 6

AXISYMMETRIC FLOW

An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack – 6

BACILLUS

The Genome of *Bacillus cereus* 14579: A Local Analysis – 119

BACKFIRE ANTENNAS

Green Bank Telescope 290 to 395 MHz Feed Analysis and Modification for Operation in the 140 to 175 MHz Band – 60

BACKGROUND RADIATION

Mapping the Baby Universe – 228

BACTERIA

A Comparison of Biotic and Inorganic Sulfide Films – 34

Life on Mars? – 230

BALLOONING MODES

Quantitative Tests of ELMs as Intermediate n Peeling-Ballooning Modes – 192

BANDWIDTH

Overview of IEPME-BW Bandwidth Testing of Bulk Data Transfer – 49

BARYONS

Duality and Other Exotic Gauge Dynamics in Softly Broken Supersymmetric QCD – 171

- First Observation of inclusive Beta to the Charmed Strange Baryons $\chi(\text{sup O})(\text{sub C})$ and $\chi(\text{sup +})(\text{sub C})$ – 176
- BAYES THEOREM**
A Bayesian Model for the Analysis of Quantal Response Data – 163
MBR-A Computer Program for Performing Nonparametric Bayesian Analyses of Ordered Binomial Data – 163
- BEAM INJECTION**
Interaction of Neutral Beam Injected Fast Ions with Ion Cyclotron Resonance Frequency Waves – 180
- BEAM INTERACTIONS**
Comparative Assessment of Simulation Tools for Beam Delivery Systems of Linear Colliders – 166
Observation of the Dynamic Beta Effect CESR with CLEO – 182
Single-Mode Coherent Synchrotron Radiation Instability – 182
Symplectic Beam-Beam Interaction with Energy Change – 166
- BEAM STEERING**
Optimization of a Spatial Light Modulator for Beam Steering and Tracking Applications – 173
- BEAMFORMING**
Image-Guided Surgery of Primary Breast Cancer Using Ultrasound Phased Arrays – 110
- BEAMS (RADIATION)**
Proposed Interim Improvement to the Tevatron Beam Position Monitors with Narrow Band Crystal Filters – 176
- BEARINGS**
Proceedings of the 2001 Earthquake Engineering Symposium for Young Researchers – 73
- BEHAVIOR**
Center for Behavioral Research: Individual Interventions for Breast Cancer Patients – 124
- BENZENE**
Dissociative Ionization and Product Distributions of Benzene and Pyridine by Electron Impact – 38
- BIBLIOGRAPHIES**
Post-Conflict Reconstruction. A Selected Bibliography – 205
- BINOMIALS**
MBR-A Computer Program for Performing Nonparametric Bayesian Analyses of Ordered Binomial Data – 163
- BIOACOUSTICS**
E-3 In-Flight Acoustic Exposure Studies and Mitigation Via Active Noise Reduction Headset – 11
- BIOCHEMISTRY**
Astrobiology: The Search for Life in the Universe – 112
Novel Lishmania and Malaria Potassium Channels: Candidate Therapeutic Targets – 110
Photon-Counting Single-Molecule Spectroscopy for Studying Conformational Dynamics and Macromolecular Interactions – 32
- BIODYNAMICS**
Compilation of Technical Papers Published Under Work Unit 72312501 (71844501) 'Acceleration Performance in Advanced Operational Systems,' 1985-2000 – 205
- BIOELECTRIC POTENTIAL**
Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – 162
- BIOGEOCHEMISTRY**
Biogeochemical Cycles in Degraded Lands – 85
- BIOINSTRUMENTATION**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59
- BIOLOGICAL EFFECTS**
The War Fighter's Stress Response: Telemetric and Noninvasive Assessment – 121
- BIOLOGICAL EVOLUTION**
Astrobiology: The Search for Life in the Universe – 112
- BIOLOGICAL WEAPONS**
Development of a Viral Biological-Threat Bioinformatics Resource – 131
Summary of the Cloud Tracking and Sampling Experiments Conducted During the DIPOLE ORBIT and DIPOLE EAST Experiments – 96
- BIOREACTORS**
Example Moisture Mass Balance Calculations for Bioreactor Landfills – 83
- BIOSYNTHESIS**
Investigations of Thaxtomin Biosynthesis – 115
- BISMUTH COMPOUNDS**
Flux-Pinning of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{(8+\delta)}$ High Tc Superconducting Tapes Utilizing $(\text{Sr,Ca})_{14}\text{Cu}_{24}\text{O}_{(41+\delta)}$ and $\text{Sr}_2\text{CaAl}_2\text{O}_6$ Defects – 35
- BIVARIATE ANALYSIS**
Determining Effects of Genes, Environment, and Gene X Environment Interaction That Are Common to Breast and Ovarian Cancers Via Bivariate Logistic Regression – 125
- BLACK HOLES (ASTRONOMY)**
Braneless Black Holes – 174
Calabi-Yau Black Holes – 222
Counting Schwarzschild and Charged Black Holes – 220
How to Build a Supermassive Black Hole – 221
More Hidden Black Hole Dangers – 229
- Probing the Inflow/Outflow and Accretion Disk of Cygnus X-1 in the High State with the Chandra High Energy Transmission Grating – 216
Ring Around the Black Hole – 229
STU Black Holes and String Theory – 220
Supersymmetric Rotating Black Holes and Attractors – 219
- BLADE-VORTEX INTERACTION**
Unsteady Flows and Airfoil-Vortex Interaction – 6
- BLAZARS**
Gamma-Ray Blazar Content of the Northern Sky – 223
- BLOOD VESSELS**
Genetically Engineered Autologous Cells for Antiangiogenic Therapy of Breast Cancer – 119
- BLUNT LEADING EDGES**
Compressibility and Leading-Edge Bluntness Effects for a 65 Deg Delta Wing – 10
- BOLOMETERS**
Parameter Comparison for Low-Noise MoAu TES Bolometers – 74
- BONE DEMINERALIZATION**
Study of RANKL Expression in Metastatic Breast Carcinoma – 116
- BONE MARROW**
Expression of Transforming Growth Factor-Beta (TGF- β) in Prostate Cancer Progression – 135
Metastasis Genes in Breast Cancer Metastasis to Bone – 117
- BONE MINERAL CONTENT**
Collagenases in Breast Cancer Cell-Induced Metastatic Tumor Growth and Progression – 116
- BONES**
Collagenases in Breast Cancer Cell-Induced Metastatic Tumor Growth and Progression – 116
In Vivo Transcriptional Activation of Estrogen Receptor Target Genes: Differential Regulation in Mammary Gland Uterus and Bone – 118
Study of RANKL Expression in Metastatic Breast Carcinoma – 116
- BOSONS**
Search for Rare Charm Meson Decays at FNAL E791 – 169
Weakly-Coupled Higgs Bosons and Precision Electroweak Physics – 170
- BOUNDARY LAYER SEPARATION**
Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings – 8
Military Vortices – 4

BOUNDARY LAYER TRANSITION

Technical Report of National Aerospace Laboratory: Transition Process of Boundary Layers on a Low-Speed Wind-Tunnel Contraction Wall – 2

BOUNDARY LAYERS

Polar Plasma Wave Investigation Data Analysis in the Extended Mission – 218

Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – 192

BRAGG GRATINGS

Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature – 186

BRANCHING (PHYSICS)

Analyses of $D + K(\text{sup } O)(\text{sub } S)$ and $D + K(\text{sup } O)(\text{sub } S)\pi$ – 179

Inclusive Decays $B \rightarrow DX$ and $B \rightarrow D^*(*)X$ – 176

Measurement of the Decay Amplitudes and Branching Fractions of $B \rightarrow J/\psi K^*$ and $B \rightarrow J/\psi K$ Decays – 177

New Measurement of $B \rightarrow D^* \pi$ Branching Fractions – 198

Search for $B \rightarrow \mu$ Anti-Muon-Neutrino Gamma and $B \rightarrow e$ Anti-Electron-Neutrino Gamma – 180

Search for Inclusive $b \rightarrow l+l$ – 200

Study of Inclusive Semileptonic B Meson Decays with the BABAR Detector – 200

BRAYTON CYCLE

High Temperature Fusion Reactor Cooling Using Brayton Cycle Based Partial Energy Conversion – 22

BREEDING (REPRODUCTION)

Advanced High Performance Solid Wall Blanket Concepts – 195

BRIDGMAN METHOD

Analysis of Radial Segregation in Directionally Solidified $\text{Hg}(0.89)\text{Mn}(0.11)\text{Te}$ – 43

BRIGHTNESS TEMPERATURE

Regional Variability in Convection and Rain Retrievals from the TRMM Microwave Imager (TMI) – 101

BROADBAND

Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 155

BROADCASTING

Amateur Radio on the International Space Station - Phase 2 Hardware System – 61

NTT Technical Review – 53

BROKEN SYMMETRY

Duality and Other Exotic Gauge Dynamics in Softly Broken Supersymmetric QCD – 171

BUCKLING

Probabilistic Dynamic Buckling of Smart Composite Shells – 75

BUOYANCY-DRIVEN FLOW

Magnetic Control of Solutal Buoyancy-driven Convection – 63

BUTENES

The Specific Refractive Index Increment for Isobutyl Poss-Polystyrene Copolymers – 37

BYPASS RATIO

Ultra High Bypass Ratio Low Noise Engine Study – 12

CADMIUM SELENIDES

Hybrid Nanorod-Polymer Solar Cell – 80

CALIBRATING

A Base for the Construction of a Calibration Current Source – 56

Analytic Solution to the Problem of Aircraft Electric Field Mill Calibration – 162

Observations and Calibrations of DMSP F15 SSM Data December 1999 - October 2000 – 48

Radiant Temperature Nulling Radiometer and Polarization Enhanced Thermal Radiometer – 67

Three-Gorge Reservoir: A 'Controlled Experiment' for Calibration/Validation of Time-Variable Gravity Signals Detected from Space – 210

CALORIMETERS

Isothermal Microcalorimetric Evaluation of Compatibility of Proposed Injector Materials with High-Test Hydrogen Peroxide Propellant – 46

CAMERAS

Electronic Imaging: Propagation, Retrieval, Recognition – 70

CANADA

Meteorites from Mars, Rocks from Canada – 231

CANCER

A Molecular Model for Repression of BRCA-1 Transcription by the Aryl Hydrocarbon Receptor – 105

A Training Program in Breast Cancer Research Using NMR Techniques – 113

Administration of Additional Phosphorylated Prolactin During Pregnancy Inhibits Mammary Ductal Branching and Promotes Premature Lobuloalveolus Development – 113

Analysis of Apaf-1 and Caspase 9 in Tumorigenesis – 108

Association Between Offspring's hCG Genotype and Breast Cancer Risk in Mothers: A Novel Approach – 112

Breast Cancer Training Program – 130

Cell Cycle Dependent Regulation of Human Progesterone in Breast Cancer – 114

Center for Behavioral Research: Individual Interventions for Breast Cancer Patients – 124

Combining Electron With Intensity Modulated Photon Beams for Breast Cancer – 123

Cooperative Interactions During Human Mammary Epithelial Cell Immortalization – 134

Determining Effects of Genes, Environment, and Gene X Environment Interaction That Are Common to Breast and Ovarian Cancers Via Bivariate Logistic Regression – 125

Development of an erbB Antagonist – 124

Dietary Methionine Restriction: Novel Treatment for Hormone Independent Prostate Cancer – 111

Direct Effects of Folate Metabolism on Gene Expression in Metastatic Breast Cancer – 133

Drug Discovery for Breast Cancer by Mirror-Image Display – 105

Dynamic Tissue Culture from Prostate Biopsy Specimens as a model for Predicting Tumor Radiosensitivity to Ionizing Radiation Treatment – 126

Effect of a Single Nucleotide Polymorphism (NP) on Breast Cancer Invasion – 126

Epidermal Growth Factor (EGF) Receptor Intron 1 CA Repeat Polymorphisms in African-American and Caucasian Males: Influence on Prostate Cancer Risk or Disease Progression and Interaction with Androgen Receptor CAG Repeat Polymorphisms – 107

Functional Analysis of Interactions Between 53BP1, BRCA1 and p53 – 105

Genes Differentially Expressed at the Transition from Premalignancy to Carcinoma – 106

Genetic Requirements for the Transformation of Human Cells – 117

Genetically Engineered Autologous Cells for Antiangiogenic Therapy of Breast Cancer – 119

Growth Inhibitory and Stimulatory Signals in Prostate Cancer – 121

Identifying and Reaching Populations at Risk: The Paradox of Breast Cancer Control – 113

Impact of Breast Cancer Treatments on Gonadal Function and Reproduction Health – 125

In Vivo Testing of Chemopreventive Agents Using the Dog Model of Spontaneous Prostate Carcinogenesis – 104

Induction of Cytotoxic T Lymphocytes for Immunotherapy of Breast Cancer – 122

Kinase Independent Functions of Cyclin D1 Which Contribute to its Oncogenic Potential In Vivo – 133

Leptin (Obesity Protein) and Breast Cancer Metastasis – 129

MCAK and Stathmin Upregulation in Breast Cancer Cells: Etiology and Response to Pharmacologic Reagents – 108

Mechanism by which p66 Shc Suppresses Breast Cancer Tumorigenicity – 129

Mechanism of Mutation in Non-Dividing Cells – 127

Mechanisms for Controlling Breast Cancer Growth and Skeletal Metastasis – 116

Molecular Characterization of Squamous Cell Carcinomas Derived From Recessive Dystrophic Epidermolysis Bullosa – 134

Monitoring Cancer Oxygenation Changes Induced by Ultrasound – 122

Neoadjuvant Anti-Angiogenesis Therapy for Prostate Cancer – 127

Novel Drug Delivery Technique for Breast Cancer Therapy – 115

P53 Regulation of Uridine Phosphorylase Activity, Pyrimidine Salvage Pathway and Their Effects on Breast Cancer Therapy – 109

Prostate Cancer in Nigerians, Jamaicans and U.S. Blacks – 205

Prostate Carcinoma Detection Using Combined Ultrasound, Elasticity, and Tissue Strain-Hardening Imaging – 126

Quasi-Pro prospective Study of Breast Cancer and Diet – 134

Recombinational Repair Genes and Breast Cancer Risk – 112

Research Training in Biopsychosocial Breast Cancer Research – 122

Role of E-Cadherin Homophilic Contacts in the Inhibition of Cell Growth of Primary Breast Cells – 129

Role of Nuclear Receptor Coactivators, AIB-1 and SRC-1, in the Development of Breast Cancer – 114

Selection of Aptamers for CED-9/Bcl-2 Family Cell Death Regulators and Their Application in Study of Apoptosis Regulation and Drug Design for Breast Cancer – 107

The Role of a FGF-Binding Protein in Breast Cancer – 124

The Role of AKT1 in Mammary Tumorigenesis and Transformation – 128

The Role of Fps in Tumor-Associated Angiogenesis – 118

The Role of GADD34 (Growth Arrest and DNA Damage- Inducible Protein) in Regulating Apoptosis, Proliferation, and Protein Synthesis in Human Breast Cancer Cells – 115

The Role of Myoepithelial Maspin in Breast Carcinoma Progression Diagnosis and Screening – 120

The Role of N-CoR During Normal Mammary Gland Development – 109

The Role of Neuropilin in Breast Cancer Metastasis – 119

The Role of S100A7/RANBPM Interaction in Human Breast Cancer – 117

The Roles of FGF-2 TGF Beta and TGF Beta Receptor 2 in Breast Cancer Dormancy – 128

Training Grant in Epidemiology and Prevention of Breast Cancer – 114

Understanding Racial Disparities in Mammography Use Among Breast Cancer Survivors – 135

CANS

Canister Transfer System Event Sequence Calculation – 202

National Emission Standards for Hazardous Air Pollutants Surface Coating of Metal Cans. Background Information for Final Standards. Summary of Public Comments and Responses – 83

CAPACITORS

Closed Form Solutions of Maxwell's Equations in the Computer Age – 140

Fast Charging of Capacitors: A Summary of a Master Thesis at Uppsala University – 57

CARBIDES

Evaluation of Cracking in Pre-Service and In-Service Snow Plow Carbide Wear Surfaces – 27

CARBON DIOXIDE

Initial Screening of Thermochemical Water-Splitting Cycles for High Efficiency Generation of Hydrogen Fuels Using Nuclear Power – 32

Intercomparison of Numerical Simulation Codes for Geologic Disposal of CO₂ – 84

Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy – 35

Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25

CARBON NANOTUBES

Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30

Spectroscopy-Based Characterization of Single Wall Carbon Nanotubes – 46

The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59

CARBONATES

Europa's Salty Surface – 226

CARBON

C/SiC Life Prediction for Propulsion Applications – 31

CARCINOGENS

Genes Differentially Expressed at the Transition from Premalignancy to Carcinoma – 106

Kinase Independent Functions of Cyclin D1 Which Contribute to its Oncogenic Potential In Vivo – 133

CARDIOVASCULAR SYSTEM

Effects of Markedly Increased Intravascular Pressure on the Volume-Flow Characteristics in Venous Vessels of Human Limbs – 1

CASSINI MISSION

Quarterly Technical Progress Report of Radioisotope Power System Materials Production and Technology Program Tasks for January through March 2000 – 61

CATALYSIS

Toward an Understanding of Catalysis by Supported Metal Nanoclusters – 27

CATALYSTS

Evaluation of Emission Characteristics Downstream of Diesel Oxidation Catalyst Technology – 84

The Thiamin Pyrophosphate-Motif – 132

CAVITIES

Real-Time Adaptive Control of Flow-Induced Cavity Tones – 62

CELL DIVISION

Dietary Methionine Restriction: Novel Treatment for Hormone Independent Prostate Cancer – 111

Mechanism of Mutation in Non-Dividing Cells – 127

Mechanisms for Controlling Breast Cancer Growth and Skeletal Metastasis – 116

CELLS (BIOLOGY)

Dynamic Tissue Culture from Prostate Biopsy Specimens as a model for Predicting Tumor Radiosensitivity to Ionizing Radiation Treatment – 126

Genetic Requirements for the Transformation of Human Cells – 117

Role of E-Cadherin Homophilic Contacts in the Inhibition of Cell Growth of Primary Breast Cells – 129

Study of RANKL Expression in Metastatic Breast Carcinoma – 116

CENTRAL PROCESSING UNITS

Space Instruments: General Considerations – 20

CENTRIFUGES

Measurements on Spatial Disorientation during Gondola Centrifugation – 136

CERAMIC MATRIX COMPOSITES

C/SiC Life Prediction for Propulsion Applications – 31

CERTIFICATION

Standardized UXO Technology Demonstration Site Blind Grid Scoring Record No. 50. Site Location: Aberdeen Proving Ground – 71

CESIUM

Caustic-Side Solvent Extraction: Anti-Caking Surfactants Found to be Cause of Apparent Effect of High Nitrite Concentration on Cesium Stripping – 28

CHANNELS

First Observation of $\tau 3(\pi)(\eta)(\nu \text{ sub } \tau)$ and $\tau f1 \pi \nu \text{ sub } \tau$ Decays – 198

CHARACTERIZATION

Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30

Experimental Evaluation and Workload Characterization for High-Performance Computer Architectures – 139

Ohio State University Cooperative Research and Development Agreement (CRDA) . Crystal Growth by Molecular Beam Epitaxy (MBE) and Characterization of Optoelectronic Devices – 72

Radiometric Characterization of IKONOS Multispectral Imagery – 77

Stimuli-Responsive Polymers with Enhanced Efficiency in Reservoir Recovery Processes. Semiannual Progress Report for Work Performed September 1, 2001 through February 28, 2002 – 26

CHARGE TRANSFER

Charge Transfer Polymers as Ultrafast Holographic Materials – 45

CHARGED PARTICLES

Electrical Charging of the Clouds of Titan – 211

CHARGING

Fast Charging of Capacitors: A Summary of a Master Thesis at Uppsala University – 57

CHARM (PARTICLE PHYSICS)

First Observation of inclusive Beta to the Charmed Strange Baryons $\chi(\text{sup } O)(\text{sub } C)$ and $\chi(\text{sup } +)(\text{sub } C)$ – 176

Investigation of Semileptonic B Meson Decay to P-Wave Charm Mesons – 180

CHEMICAL COMPOSITION

Astrobiology: The Search for Life in the Universe – 112

Europa's Salty Surface – 226

Genesis Discovery Mission: Science Canister Processing at JSC – 237

Mercury Unveiled – 212

New Data, New Ideas, and Lively Debate about Mercury – 212

The Martian Interior – 230

The Specific Refractive Index Increment for Isobutyl Poss-Polystyrene Copolymers – 37

CHEMICAL ELEMENTS

Investigating the Partitioning of Inorganic Elements Consumed by Humans between the Various Fractions of Human Wastes: An Alternative Approach – 33

CHEMICAL REACTIONS

Europa and Titan: Oceans in the Outer Solar System? – 209

Intercomparison of Numerical Simulation Codes for Geologic Disposal of CO₂ – 84

Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy – 35

Ultrafast Infrared Studies of Complex Ligand Rearrangements in Solution – 34

CHEMICAL WARFARE

Summary of the Cloud Tracking and Sampling Experiments Conducted During the DIPOLE ORBIT and DIPOLE EAST Experiments – 96

CHEMOTHERAPY

In Vivo Testing of Chemopreventive Agents Using the Dog Model of Spontaneous Prostate Carcinogenesis – 104

Novel Drug Delivery Technique for Breast Cancer Therapy – 115

CHLOROPHYLLS

Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104

CHROMATES

HVOF Application of Nickel and Nickel Alloy to Tungsten Heavy Alloy for Jacketed Penetrators – 40

CHROMIUM

Biological Controls on the Precipitation of Chromium in Harbor Sediments – 33

CHROMOSOMES

MCAK and Stathmin Upregulation in Breast Cancer Cells: Etiology and Response to Pharmacologic Regagents – 108

CIRCUIT PROTECTION

Protections Against HPM Front-Door Coupling: A Survey of Commercial Limiters – 53

CIRCUITS

Electrical Equivalent Circuit Simulations of the Pulsed-Power Conditioning System TTHPM – 56

CIRCULATION

High Power Liquid Hydrogen Target for Parity Violation Experiments – 171

CITIES

A Downscaling Analysis of the Urban Influence on Rainfall: TRMM Satellite Component AMS Conference on Satellite Meteorology and Oceanography – 98

Implementation of an Urban Canopy Parameterization in MM5 for Meso-Gamma-Scale Air Quality Modeling Applications – 95

CIVIL AVIATION

Digital Avionics – 12

Optimum Climb to Cruise Noise Trajectories for the High Speed Civil Transport – 9

CLASSIFICATIONS

Objective Classification of Radar Profile Types, and Their Relationship to Lightning Occurrence – 52

CLIENT SERVER SYSTEMS

A Publish/Subscribe Based Architecture of an Alert Server to Support Prioritized and Persistent Alerts – 143

CLIMATE MODELS

Goddard Cumulus Ensemble (GCE) Model: Application for Understanding Precipitation Processes – 90

Vorticity-Divergence Global Semi-Lagrangian Spectral Model for the Shallow Water Equations – 95

CLIMATE

EOSDIS Project on High-Performance I/O Techniques – 146

Working Toward a Healthy Planet – 135

CLIMATOLOGY

A Downscaling Analysis of the Urban Influence on Rainfall: TRMM Satellite Component AMS Conference on Satellite Meteorology and Oceanography – 98

Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space – 98

Satellites as Sentinels for Climate and Health – 70

CLIMBING FLIGHT

Optimum Climb to Cruise Noise Trajectories for the High Speed Civil Transport – 9

CLINICAL MEDICINE

An Assessment of the Potential for Increasing the Salvageability of Critical Combat Traumas Through First Responder Interventions – 132

Impact of Breast Cancer Treatments on Gonadal Function and Reproduction Health – 125

Neoadjuvant Anti-Angiogenesis Therapy for Prostate Cancer – 127

CLOUD COVER

Remote Sensing – 78

CLOUD PHYSICS

Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – 88

Global Multispectral Cloud Retrievals from MODIS – 69

Goddard Cumulus Ensemble (GCE) Model: Application for Understanding Precipitation Processes – 90

ICESat: Ice, Cloud, and Land Elevation Satellite – 94

- Use of Collocated KWAJEX Satellite, Aircraft, and Ground Measurements for Understanding Ambiguities in TRMM Radiometer Rain Profile Algorithm – 96
- CLOUDS (METEOROLOGY)**
 An Equation for Moist Entropy in a Precipitating and Icy Atmosphere – 102
 Goddard Cumulus Ensemble (GCE) Model: Application for Understanding Precipitation Processes – 90
 Summary of the Cloud Tracking and Sampling Experiments Conducted During the DIPOLE ORBIT and DIPOLE EAST Experiments – 96
- CLUSTER ANALYSIS**
 Commodity Cluster Computing for Remote Sensing Applications using Red Hat LINUX – 143
 Objective Classification of Radar Profile Types, and Their Relationship to Lightning Occurrence – 52
- COAL GASIFICATION**
 Development of On-Line Temperature Measurement Instrumentation for Gasification Process Control. Semi-annual rept., 4/1/2000-9/31/2000 – 26
 Development of On-Line Temperature Measurement Instrumentation for Gasification Process Control. Semi-annual rept. ending 4/01/2001 – 27
- COATINGS**
 C/SiC Life Prediction for Propulsion Applications – 31
 Development of Nickel Alloy Substrates for Y-Ba-Cu-O Coated Conductor Applications – 38
 Laboratory Evaluation of Moisture Cure Urethane Coatings – 28
 Recent Progress in Fabrication of High-Strength Glow Discharge Polymer Shells by Optimization of Coating Parameters – 177
 Tribometric Optical and Electrical Properties of Sputtered Quasicrystalline – 29
- COGNITION**
 Cognitive Measures of Vietnam-Era Prisoners of War – 131
 The War Fighter's Stress Response: Telemetric and Noninvasive Assessment – 121
- COHERENT RADIATION**
 Calculation of the Coherent Synchrotron Radiation Impedance from a Wigglers – 173
 Single-Mode Coherent Synchrotron Radiation Instability – 182
- COLLIMATORS**
 Beam Collimation at Hadron Colliders – 199
- COLLISION PARAMETERS**
 Comparison of Quantum Mechanical and Classical Trajectory Calculations of Cross Sections for Ion-Atom Impact Ionization of Negative- and Positive-Ions for Heavy Ion Fusion Applications – 193
- COLLISIONLESS PLASMAS**
 Self-Consistent System of Equations for a Kinetic Description of the Low-Pressure Discharges Accounting for the Nonlocal and Collisionless Electron Dynamics – 193
- COLOR**
 Measurement of the Decay Amplitudes and Branching Fractions of B arrow J/psiK* and B arrow J/psiK Decays – 177
- COLUMBIA (ORBITER)**
 STS-107 Mission Highlights Resource, Part 2 of 4 – 17
- COMBAT**
 Single Integrated Air Picture (SIAP) Attributes – 150
- COMBUSTION CHAMBERS**
 Mixing and Combustion in Vortex Dominated Combustors with Distributed Air and Fuel-Injection – 37
- COMBUSTION TEMPERATURE**
 Mixing and Combustion in Vortex Dominated Combustors with Distributed Air and Fuel-Injection – 37
- COMBUSTION**
 Mixing and Combustion in Vortex Dominated Combustors with Distributed Air and Fuel-Injection – 37
- COMETS**
 1997 Apparition of Comet Hale-Bopp Historical Comet Observations – 233
 Simulation of Prebiotic Processing by Comet and Meteoroid Impact: Implications for Life on Early Earth and Other Planets – 236
- COMMAND AND CONTROL**
 Annual Report 2002 on FOI's Research on Command, Control, Communication and Information Technology (C31) – 51
 Effective Coordination of Multiple Intelligent Agents for Command and Control – 158
- COMMERCE**
 Digital Economy, 2003 – 204
- COMMODITIES**
 Commodity Cluster Computing for Remote Sensing Applications using Red Hat LINUX – 143
- COMMUNICATION EQUIPMENT**
 YMER User Guide – 51
- COMMUNICATION NETWORKS**
 Connectivity and Reliability in Ad Hoc Networks – 50
 Digital Avionics – 12
 Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 49
- Telecommunication Networks for Mobile & Distributed Communications/ Computing – 52
- COMMUNICATION SATELLITES**
 Space Weather: The Invisible Enemy – 209
- COMMUNITIES**
 Spatial Information Technology Center at Fulton-Montgomery Community College – 201
- COMPILERS**
 ASC3: Algorithmic Strategies for Compiler Controlled Caches – 151
 Compiler Optimizations for Power-Aware Computing. Volume 1 of 2 – 153
 Compiler Optimizations for Power-Aware Computing. Volume 2 of 2 – 143
 Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications – 157
 PACT: Power Aware Compilation and Architectural Techniques – 151
- COMPONENT RELIABILITY**
 Upgradable Operational Availability Forecasting Tool For the U.S. Navy P-3 Replacement Aircraft – 11
- COMPOSITE MATERIALS**
 Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
 Journal of Research of the National Institute of Standards and Technology, May-June 2003. Volume 108, No. 3 – 243
 ManTech Journal. Meeting the Challenge. Volume 10, Number 2, 1985 – 31
 Production of Nanocomposites – 29
 Washing Bridges to Reduce Chloride – 31
- COMPOSITE PROPELLANTS**
 Ageing Control Number 3 of Propellants for Rocket Motors RB 75 Maverick – 46
- COMPOSITE STRUCTURES**
 Probabilistic Dynamic Buckling of Smart Composite Shells – 75
- COMPOSITION (PROPERTY)**
 Presolar Grains of Star Dust: Astronomy Studied with Microscopes – 225
- COMPRESSED AIR**
 Compressed Air System Survey at Army Industrial Facilities – 66
 Compressed Air System Survey at Sierra Army Depot, CA – 81
- COMPRESSIBILITY EFFECTS**
 Compressibility and Leading-Edge Bluntness Effects for a 65 Deg Delta Wing – 10
- COMPRESSORS**
 Compressed Air System Survey at Army Industrial Facilities – 66
 Temperature Swing Adsorption Compressor Development – 74

COMPUTATIONAL FLUID DYNAMICS

A New Modular Approach for Tightly Coupled Fluid/Structure Analysis – 63

CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft – 3

Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications – 157

Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control – 7

Heat Transfer Modelling in Gas Turbine Stage – 13

Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – 66

Task Assignment Heuristics for Parallel and Distributed CFD Applications – 65

Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – 62

Unsteady RANS Calculations for the GFSI Bump Preliminary Study Using EURANUS 5.3 – 1

Vortex Effects in the Dynamics of Underwater Weapons – 153

COMPUTATIONAL GRIDS

A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – 156

Cartesian and Adaptive Methods for Complex Geometries – 162

Failure Prediction of Underwater Structures - Subdomain Decomposition and Meshfree Methods – 169

Task Assignment Heuristics for Parallel and Distributed CFD Applications – 65

Vorticity-Divergence Global Semi-Lagrangian Spectral Model for the Shallow Water Equations – 95

COMPUTATION

Canister Transfer System Event Sequence Calculation – 202

Commodity Cluster Computing for Remote Sensing Applications using Red Hat LINUX – 143

Cosmological Calculation Suggesting a Threshold for New Physics at 5 Tev – 223

From Materials to Missions Assess-Predict-Optimize: A Computational Approach to Adaptive Design – 161

Satellites as Sentinels for Climate and Health – 70

COMPUTER AIDED DESIGN

Modified Involute Helical Gears: Computerized Design, Simulation of Meshing and Stress Analysis – 147

COMPUTER AIDED MAPPING

Geodata Modeling and Query in Geographic Information Systems – 144

COMPUTER INFORMATION SECURITY

BaBar Web Job Submission with Globus Authentication and AFS Access – 154

Geodata Modeling and Query in Geographic Information Systems – 144

Management Planning Guide for Information Systems Security Auditing – 141

NTT Technical Review – 53

Proposed Taxonomy of Software Weapons – 140

COMPUTER NETWORKS

Application- and Network-Cognizant Proxies – 155

Center of Excellence in Space Data and Information Sciences – 207

Image Systems Using RFID Tag Positioning Information – 54

Internet Performance and Reliability Measurements – 142

NTT Technical Review – 53

Scalable Content Delivery Technology – 155

Simulation-Based Study of High Speed TCP and its Deployment – 141

Spot Information Navigator – 55

Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 55

COMPUTER PROGRAMMING

Development and Operations of the Astrophysics Data System – 219

COMPUTER PROGRAMS

A New Vortex Flow Experiment for Computer Code Validation – 150

Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles – 21

Applying Jlint to Space Exploration Software – 153

Compiler Optimizations for Power-Aware Computing. Volume 1 of 2 – 153

Compiler Optimizations for Power-Aware Computing. Volume 2 of 2 – 143

Effective Coordination of Multiple Intelligent Agents for Command and Control – 158

Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147

Expert Seeker: A People-Finder Knowledge Management System – 159

Improved Infrared Object Signature Calculations for SensorVision (Trade Mark) by the Use of RadTherm (Trade Mark) – 188

Integrated Optical Design Analysis (IODA): New Test Data and Modeling Features – 152

LLAMA (Lincoln Laboratory Advanced MARTHA Applications) Software Manual – 154

PACT: Power Aware Compilation and Architectural Techniques – 151

Passive Superconducting Shielding: Experimental Results and Computer Models – 197

Rule-Based Runtime Verification – 158

Shared Semantic Representations for Coordinating Distributed Robot Teams – 151

Single Integrated Air Picture (SIAP) Attributes – 150

Software Surveyor – 148

COMPUTER SYSTEMS PROGRAMS

An Expert System for the Development of Efficient Parallel Code – 152

EAGLE can do Efficient LTL Monitoring – 158

EAGLE Monitors by Collecting Facts and Generating Obligations – 148

Execution-Based Model Checking of Interrupt-Based Systems – 157

Scoping Planning Agents With Shared Models – 160

COMPUTERIZED SIMULATION

Annual Report 2002 on FOI:s Research on Modelling and Simulation – 140

Comparative Assessment of Simulation Tools for Beam Delivery Systems of Linear Colliders – 166

Electrical Equivalent Circuit Simulations of the Pulsed-Power Conditioning System TTHPM – 56

Initial Experiences with Retrieving Similar Objects in Simulation Data – 181

KRYP, a Finite Element Program for Crystal Plasticity – 27

Magnetosphere: Space Weather Research with Computer Simulations – 89

Mission Simulation Facility: Simulation Support for Autonomy Development – 160

Modified Involute Helical Gears: Computerized Design, Simulation of Meshing and Stress Analysis – 147

Numerical Modelling of Vortex Flow Instabilities and Interactions – 8

Pre-Game-Theory Based Information Technology (GAMBIT) Study – 165

Probabilistic Dynamic Buckling of Smart Composite Shells – 75

Ship Shock Trial Modeling and Simulation of USS WINSTON S. CHURCHILL (DDG 81) – 149

Simulation of Prebiotic Processing by Comet and Meteoroid Impact: Implications for Life on Early Earth and Other Planets – 236

Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure – 3

Simulation-Based Study of High Speed TCP and its Deployment – 141

- Space Weather Research with Computer Simulations – 154
- Stormtime Particle Energization with AMIE Potentials – 88
- Structural Evaluation of Exo-Skeletal Engine Fan Blades – 75
- Vortex Effects in the Dynamics of Underwater Weapons – 153
- COMPUTERS**
- Data Intensive Systems (DIS) Benchmark Performance Summary – 156
- CONDENSING**
- Chiral Rings, Mirror Symmetry and the Fate of Localized Tachyons – 169
- Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25
- CONDUCTIVITY**
- Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
- CONFERENCES**
- Compilation of Technical Papers Published Under Work Unit 72312501 (71844501) 'Acceleration Performance in Advanced Operational Systems,' 1985-2000 – 205
- CONFIGURATION MANAGEMENT**
- Three Corner Sat Constellation – 16
- CONFINEMENT**
- Physics and Control of ELMing H-Mode Negative Central Shear Advanced Tokamak Scenario Based on Experimental Profiles for ITER – 191
- CONFORMAL MAPPING**
- A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – 156
- CONJUGATES**
- Conjugate Auroral Imagery – 91
- CONSTELLATIONS**
- High Performance Computing Clusters, Constellations, MPPs, and Future Directions – 140
- CONSTRUCTION**
- A Base for the Construction of a Calibration Current Source – 56
- CONTAMINANTS**
- Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation – 29
- Great Lakes Binational Toxics Strategy U.S. Challenge on Alkyl-lead: Report on Use of Alkyl-lead in Automotive Gasoline – 82
- Optical Properties of the DIRC Fused Silica Cherenkov Radiator – 181
- Performance and Economics of Catalytic Glow Plugs and Shields in Direct Injection Natural Gas Engines for the Next Generation Natural Gas Vehicle Program – 73
- Satellites as Sentinels for Climate and Health – 70
- Working Toward a Healthy Planet – 135
- CONTAMINATION**
- Biological Controls on the Precipitation of Chromium in Harbor Sediments – 33
- CONTRACTORS**
- ManTech Journal. Guidelines for Defense Contractors. Volume 8/Number 2 – 9
- CONTRACTS**
- Contract Representation for Run-Time Monitoring and Enforcement – 138
- CONTROL SYSTEMS DESIGN**
- How to Prepare a Startup, Shutdown, Malfunction Plan for Collection and Control Systems at Municipal Solid Waste Landfills – 82
- CONTROLLERS**
- Dual Mode Inverter Control Test Verification – 57
- CONTROL**
- Multiobject Robust Control of Nonlinear Systems via State Dependent Coefficient Representations and Applications – 162
- CONVECTION**
- Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field – 93
- Generation of Convection in the Magnetosphere-Ionosphere Coupling System – 93
- Magnetic Control of Solutal Buoyancy-driven Convection – 63
- Magnetosphere: Generation of Convection in the Magnetosphere-ionosphere Coupling System – 90
- Regional Variability in Convection and Rain Retrievals from the TRMM Microwave Imager (TMI) – 101
- Triggering of Convection – 100
- CONVERSION**
- Contract Representation for Run-Time Monitoring and Enforcement – 138
- Model Checking Correctness Properties of Electronic Contracts – 139
- COOLERS**
- Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – 70
- COOLING SYSTEMS**
- The Importance of Cooling Technology in Propulsion and Power Systems – 13
- COOLING**
- High Temperature Fusion Reactor Cooling Using Brayton Cycle Based Partial Energy Conversion – 22
- COPOLYMERIZATION**
- The Specific Refractive Index Increment for Isobutyl Poss-Polystyrene Copolymers – 37
- COPPER ALLOYS**
- A Comparison of Biotic and Inorganic Sulfide Films – 34
- COPPER**
- Lithium-Based Electrochromic Mirrors – 39
- CORONAL MASS EJECTION**
- Eruption of a Multiple-Turn Helical Magnetic Flux Tube in a Large Flare: Evidence for External and Internal Reconnection that Fits the Breakout Model of Solar Magnetic Eruptions – 238
- Interplanetary Magnetic Flux Ropes – 241
- Solar and Solar Wind: Interplanetary Magnetic Flux Ropes – 89
- Solar and Solar Wind: Solar Wind and Interplanetary Disturbances – 239
- Solar Wind and Interplanetary Disturbances – 240
- CORRELATION**
- Recursive Terrain Navigation. Application of the Correlation Method – 160
- Tau Neutrino Helicity from h plus or minus Energy Correlations – 178
- CORROSION PREVENTION**
- Development of Oxidation Protection Coatings for Gamma Titanium Aluminide Alloys – 43
- Time-Resolved Photoelectron Spectroscopy of Oxidation on the Ti(0001) Surface – 33
- CORROSION RESISTANCE**
- Examination of Compatibility of Cavitation-Resistance Modifications to Type 316LN Stainless Steel in a Mercury Thermal Convection Loop – 39
- Fe-Al Weld Overlay and High-Velocity Oxy-Fuel Thermal Spray Coatings for Corrosion Protection of Waterwalls in Fossil Fired Plants with Low NOx Burners – 34
- CORROSION**
- A Comparison of Biotic and Inorganic Sulfide Films – 34
- COSMIC BACKGROUND EXPLORER SATELLITE**
- An Empirical Decomposition of Near-IR Emission into Galactic and Extragalactic Components – 216
- COSMIC DUST**
- X-ray Haloes and Scattering by Interstellar Grains – 236
- COSMIC MICROWAVE BACKGROUND RADIATION**
- A Polarized Universe – 227
- COSMIC RAYS**
- Fun Times with Cosmic Rays – 221
- The EUSO Mission – 215
- COSMOLOGY**
- Brane Gas Cosmology, M-Theory and Little String Theory – 234

- Cosmological Calculation Suggesting a Threshold for New Physics at 5 Tev – [223](#)
- Emission Line Galaxies in the STIS Parallel Survey – [217](#)
- Gamma-Ray Bursts and Cosmology – [224](#)
- Geometrization of Matter Proposal in the Barrett-Crane Model and Resolution of Cosmological Problems – [217](#)
- The Center of the Galaxy – [214](#)
- COUETTE FLOW**
- Circulation in a Short Cylindrical Couette System – [66](#)
- CRACKING (FRACTURING)**
- Evaluation of Cracking in Pre-Service and In-Service Snow Plow Carbide Wear Surfaces – [27](#)
- CRATERING**
- Cratering of the Moon – [231](#)
- Impact Craters in the Solar System – [233](#)
- CRATERS**
- Bands on Europa – [231](#)
- Big Mountain, Big Landslide on Jupiter's Moon, Io – [232](#)
- For a Cup of Water on Mars: Gusev Crater – [230](#)
- Mercury Unveiled – [212](#)
- New Data, New Ideas, and Lively Debate about Mercury – [212](#)
- Uranus, Neptune, and the Mountains of the Moon – [226](#)
- CRAY COMPUTERS**
- A Performance Evaluation of the Cray X1 for Scientific Applications – [156](#)
- Performance Analysis of the Unitree Central File – [146](#)
- CROSS SECTIONS**
- An Experimental and Computational Study of the Aerodynamics of a Square Cross-Section Body at Supersonic Speeds – [160](#)
- Measurement of the total Cross Section for (positon)(Electron) at square root of $\sqrt{s}=10.52$ GeV – [170](#)
- CRUISING FLIGHT**
- Optimum Climb to Cruise Noise Trajectories for the High Speed Civil Transport – [9](#)
- Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – [62](#)
- CRUSTS**
- Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – [97](#)
- Mercury Unveiled – [212](#)
- The Europa Scene in the Voyager-Galileo Era – [232](#)
- The Martian Interior – [230](#)
- CRYOGENIC COOLING**
- A 10 Kelvin Magnet for Space-Flight ADRs – [210](#)
- Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – [70](#)
- CRYOGENIC TEMPERATURE**
- High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures – [65](#)
- Instrument for Measuring Cryo CTE – [47](#)
- Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature – [186](#)
- CRYOGENICS**
- Passive Superconducting Shielding: Experimental Results and Computer Models – [197](#)
- CRYPTOGRAPHY**
- Most Advanced Wireless Technology in Scotland Launched at EICC – [147](#)
- Three Leading Japanese Firms Jointly Develop a New Encryption Technology: Elliptic Curve Cryptosystem (ECDSA Signature) – [147](#)
- CRYSTAL DEFECTS**
- Flux-Pinning of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{(8+\delta)}$ High Tc Superconducting Tapes Utilizing $(\text{Sr,Ca})_{14}\text{Cu}_{24}\text{O}_{(41+\delta)}$ and $\text{Sr}_2\text{CaAl}_2\text{O}_6$ Defects – [35](#)
- CRYSTAL GROWTH**
- Ohio State University Cooperative Research and Development Agreement (CRDA) . Crystal Growth by Molecular Beam Epitaxy (MBE) and Characterization of Optoelectronic Devices – [72](#)
- Simulation of Transport Phenomena in Aluminum Nitride Single-Crystal Growth – [196](#)
- Thirteenth Workshop on Crystalline Silicon Solar Cell Materials and Processes. Extended Abstracts and Papers – [79](#)
- Use of Plastic Capillaries for Macromolecular Crystallization – [132](#)
- CRYSTALLINITY**
- Growth Induced Magnetic Anisotropy in Crystalline and Amorphous Thin Films – [38](#)
- Thirteenth Workshop on Crystalline Silicon Solar Cell Materials and Processes. Extended Abstracts and Papers – [79](#)
- CRYSTALLIZATION**
- Use of Plastic Capillaries for Macromolecular Crystallization – [132](#)
- CULTURAL RESOURCES**
- Use of IKONOS Data for Mapping Cultural Resources of Stennis Space Center, Mississippi – [79](#)
- CULTURE TECHNIQUES**
- Dynamic Tissue Culture from Prostate Biopsy Specimens as a model for Predicting Tumor Radiosensitivity to Ionizing Radiation Treatment – [126](#)
- Marine Mammal Health: Development of Immunodiagnostic and Viral Diagnostic Methodologies and Reagents – [123](#)
- CYCLIC COMPOUNDS**
- Hydrolysis of Levinstein Mustard (H) – [36](#)
- CYCLOHEXANE**
- Hydrolysis of Levinstein Mustard (H) – [36](#)
- CYCLOTRON RADIATION**
- Investigations of Low and Moderate Harmonic Fast Wave Physics on CDX-U – [182](#)
- Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak – [192](#)
- CYCLOTRON RESONANCE DEVICES**
- Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak – [192](#)
- CYCLOTRON RESONANCE**
- Interaction of Neutral Beam Injected Fast Ions with Ion Cyclotron Resonance Frequency Waves – [180](#)
- CYCLOTRONS**
- Complete Suppression of the $m=2/n=1$ Neoclassical Tearing Mode using Electron Cyclotron Current Drive on DIII-D – [178](#)
- CYGNUS CONSTELLATION**
- Probing the Inflow/Outflow and Accretion Disk of Cygnus X-1 in the High State with the Chandra High Energy Transmission Grating – [216](#)
- CYLINDRICAL BODIES**
- An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack – [6](#)
- Circulation in a Short Cylindrical Couette System – [66](#)
- Cylindrical Wire Electrical Discharge Machining of Metal Bond Diamond Wheels Part II: Wheel Wear Mechanism – [45](#)
- CYTOLOGY**
- The Role of S100A7/RANBPM Interaction in Human Breast Cancer – [117](#)
- DAMAGE**
- Damage by Impact: The Case at Meteor Crater, Arizona – [209](#)
- Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – [100](#)
- DATA ACQUISITION**
- Automated Data Collection, Analysis, and Archival – [204](#)
- Center of Excellence in Space Data and Information Sciences – [208](#)
- Moving NASA Remote Sensing Data to the GIS Environment for Health Studies – [77](#)
- Portable Physical Activity Monitors for Measuring Energy Metabolism in ROTC Cadets – [121](#)

- Precision Structural Mechanics Instrumentation System – 157
- San Clemente Island Undersea Range Acoustic Experiment, July 2002 – 185
- The Europa Scene in the Voyager-Galileo Era – 232
- Three-Gorge Reservoir: A 'Controlled Experiment' for Calibration/Validation of Time-Variable Gravity Signals Detected from Space – 210
- Time Synchronization of a TDA-Based Position Finding System – 61
- DATA BASE MANAGEMENT SYSTEMS**
- ASC3: Algorithmic Strategies for Compiler Controlled Caches – 151
- Geodata Modeling and Query in Geographic Information Systems – 144
- DATA BASES**
- A Visual Database System for Image Analysis on Parallel Computers and its Application to the EOS Amazon Project – 159
- Automated Data Collection, Analysis, and Archival – 204
- Science and Technology Text Mining: Hypersonic and Supersonic Flow – 203
- The Prostate Expression Database (PEDB) – 106
- U.S. LCI Database Project-Phase I Final Report – 203
- Verge of One Petabyte: The Story Behind the BaBar Database – 167
- DATA COMPRESSION**
- Image Compression: Algorithms and Architectures – 146
- DATA MANAGEMENT**
- Center of Excellence in Space Data and Information Sciences – 207
- Geodata Modeling and Query in Geographic Information Systems – 144
- DATA PROCESSING EQUIPMENT**
- Distributed Offline Data Reconstruction in BABAR – 167
- DATA PROCESSING**
- Automated Data Processing as an AI Planning Problem – 69
- BaBar Web Job Submission with Globus Authentication and AFS Access – 154
- Center of Excellence in Space Data and Information Sciences – 208
- Compiler Optimizations for Power-Aware Computing. Volume 2 of 2 – 143
- COPPER: Compiler-Controlled On-Demand Approach to Power-Efficient Computing – 149
- EOSDIS Project on High-Performance I/O Techniques – 146
- Internet Performance and Reliability Measurements – 142
- Navigation and Vessel Inspection Circular No. 8-01, Change 1. CH-1 to NVIC 8-01, Approval of Navigation Equipment for Ships – 201
- DATA RETRIEVAL**
- A Step Beyond Simple Keyword Searches: Services Enabled by a Full Content Digital Journal Archive – 206
- DATA SYSTEMS**
- A Scalability Model for ECS's Data Server – 144
- Data Intensive Systems (DIS) Benchmark Performance Summary – 156
- Development and Operations of the Astrophysics Data System – 219
- DATA TRANSMISSION**
- Application- and Network-Cognizant Proxies – 155
- Overview of IEPME-BW Bandwidth Testing of Bulk Data Transfer – 49
- Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – 205
- Simulation-Based Study of High Speed TCP and its Deployment – 141
- DATA**
- The Europa Scene in the Voyager-Galileo Era – 232
- DEBRIS**
- High Resolution Imaging of Circumstellar Disks at Millimeter Wavelengths – 212
- DECAY RATES**
- Measurement of the Overline Beta D1 Overline nv Partial Width and Form Factor Parameters – 196
- Measurement of the Tau Lepton Lifetime – 171
- DECAY**
- Measurement of the Decay Amplitudes and Branching Fractions of B arrow J/psiK* and B arrow J/psiK Decays – 177
- DECISION THEORY**
- Hybrid Discrete-Continuous Markov Decision Processes – 141
- DECOMPOSITION**
- An Empirical Decomposition of Near-IR Emission into Galactic and Extragalactic Components – 216
- DEFENSE PROGRAM**
- Compressed Air System Survey at Army Industrial Facilities – 66
- Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – 128
- DEGRADATION**
- Biogeochemical Cycles in Degraded Lands – 85
- DEIMOS**
- The Ph-D Project: Manned Expedition to the Moons of Mars – 233
- DELTA WINGS**
- An Experimental Investigation of Leading Edge Vortices and Passage to Stall of Nonslender Delta Wings – 4
- CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft – 3
- Compressibility and Leading-Edge Bluntness Effects for a 65 Deg Delta Wing – 10
- Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – 6
- Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings – 8
- Model of Unsteady Aerodynamic Coefficients of a Delta Wing Aircraft at High Angles of Attack – 6
- Motion Effects on Leading-Edge Vortex Behavior over Delta Wings and Generalized Modeling – 7
- DEOXYGENATION**
- Monitoring Cancer Oxygenation Changes Induced by Ultrasound – 122
- DEOXYRIBONUCLEIC ACID**
- Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – 32
- Effect of a Single Nucleotide Polymorphism (NP) on Breast Cancer Invasion – 126
- Oxidative Damage in Parkinson's Disease – 120
- Recombinational Repair Genes and Breast Cancer Risk – 112
- The Role of GADD34 (Growth Arrest and DNA Damage- Inducible Protein) in Regulating Apoptosis, Proliferation, and Protein Synthesis in Human Breast Cancer Cells – 115
- DEPLOYMENT**
- Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – 128
- DEPOSITION**
- Localized Flow Control in High Speed Flows Using Laser Energy Deposition – 5
- DERIVATION**
- Derivation of a Tasseled Cap Transformation Based on Landsat 7 At-Satellite Reflectance – 15
- DESIGN ANALYSIS**
- Design and Simulation of Transmission Properties of Hollow Bragg Fibers Fabricated from Omnidirectionally Reflective Composite Dielectric Materials – 58
- From Materials to Missions Assess-Predict-Optimize: A Computational Approach to Adaptive Design – 161
- Improving Retroviral Vectors for Gene Therapy of Prostate Cancer – 133

DESIGN

SLAC Design and Manufacturing Process of Sphere-Mounted Reflectors – 187

DETECTION

Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – 32

Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – 200

Validation of Envisat Ozone Data Products using Satellite and Ground Based Data – 96

DETECTORS

Optical Properties of the DIRC Fused Silica Cherenkov Radiator – 181

Study of Inclusive Semileptonic B Meson Decays with the BABAR Detector – 200

DEUTERIUM

High Power Liquid Hydrogen Target for Parity Violation Experiments – 171

New Interpretation of Alpha-Particle-Driven Instabilities in Deuterium-Tritium Experiments on the Tokamak Fusion Test Reactor – 189

DIAGNOSIS

Development of a Viral Biological-Threat Bioinformatics Resource – 131

Marine Mammal Health: Development of Immunodiagnostic and Viral Diagnostic Methodologies and Reagents – 123

Monitoring Cancer Oxygenation Changes Induced by Ultrasound – 122

Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster – 189

The Role of Myoepithelial Maspin in Breast Carcinoma Progression Diagnosis and Screening – 120

DIAMONDS

Cylindrical Wire Electrical Discharge Machining of Metal Bond Diamond Wheels Part II: Wheel Wear Mechanism – 45

Diamond Semiconductors Operate at Highest Frequency Ever: A Step Closer to Diamond Devices for Communication Satellites, Broadcasting Stations, and Radars – 54

DIELECTRICS

Plasma Dielectric Tensor for Non-Maxwellian Distributions in the FLR Limit – 182

DIESEL ENGINES

Engine Blowdown Device – 73

Evaluation of Emission Characteristics Downstream of Diesel Oxidation Catalyst Technology – 84

DIETS

Quasi-Prospective Study of Breast Cancer and Diet – 134

DIGITAL SYSTEMS

Digital Avionics – 12

DIMENSIONAL MEASUREMENT

Measurement of Precision Geometric Distances to Three Anchor Points in the Local Universe – 67

DIRECTIONAL SOLIDIFICATION (CRYSTALS)

Analysis of Radial Segregation in Directionally Solidified Hg(0.89)Mn(0.11)Te – 43

DISCONTINUITY

What are the Causes of the Formation of the Sub-Alfvénic Flows at the High Latitude Magnetopause – 18

DISCRETE FUNCTIONS

Hybrid Discrete-Continuous Markov Decision Processes – 141

DISEASES

Quasi-Prospective Study of Breast Cancer and Diet – 134

DISORIENTATION

Measurements on Spatial Disorientation during Gondola Centrifugation – 136

DISPLAY DEVICES

Drug Discovery for Breast Cancer by Mirror-Image Display – 105

Polymer Light-Emitting Diode (PLED) Process Development – 57

WIRED: World-Wide Web Interactive Remote Event Display – 142

DISTANCE

Measurement of Precision Geometric Distances to Three Anchor Points in the Local Universe – 67

The Gamma-Ray Burst Next Door – 220

DISTRIBUTED PROCESSING

A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – 156

A New Modular Approach for Tightly Coupled Fluid/Structure Analysis – 63

DISTRIBUTION FUNCTIONS

Large Aspect Ratio Limit of Neoclassical Transport Theory – 181

MBR-A Computer Program for Performing Nonparametric Bayesian Analyses of Ordered Binomial Data – 163

DIVERTERS

ELM Particle and Energy Transport in the SOL and Divertor of DIII-D – 191

DMSP SATELLITES

Observations and Calibrations of DMSP F15 SSM Data December 1999 - October 2000 – 48

DOGS

In Vivo Testing of Chemopreventive Agents Using the Dog Model of Spontaneous Prostate Carcinogenesis – 104

DOORS

Protections Against HPM Front-Door Coupling: A Survey of Commercial Limiters – 53

DOPPLER EFFECT

Preliminary Observations Regarding LDV Scans of Panels Excited by Broadband Actuators at the US Capitol – 72

DRAG REDUCTION

ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – 19

DRAG

Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – 62

DRONE VEHICLES

Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control – 7

DRUGS

Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – 36

Drug Discovery for Breast Cancer by Mirror-Image Display – 105

Neoadjuvant Anti-Angiogenesis Therapy for Prostate Cancer – 127

Novel Drug Delivery Technique for Breast Cancer Therapy – 115

Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37

DRYING

For a Cup of Water on Mars: Gusev Crater – 230

DUCTS

Recent Observing System Simulation Experiments at the NASA DAO – 101

DUST

Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – 88

Working Toward a Healthy Planet – 135

DYNAMIC LOADS

Demonstration of the Ability of RCAS to Model Wind Turbines – 2

Probabilistic Dynamic Buckling of Smart Composite Shells – 75

DYNAMIC STABILITY

Computational Methods for Dynamic Stability and Control Derivatives – 14

DYNAMIC STRUCTURAL ANALYSIS

Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – 18

DYNAMICAL SYSTEMS

Nonlinear Dynamics and Ergodic Theory Methods in Control – 64

DYNAMICS

Photon-Counting Single-Molecule Spectroscopy for Studying Conformational Dynamics and Macromolecular Interactions – [32](#)

E-3A AIRCRAFT

E-3 In-Flight Acoustic Exposure Studies and Mitigation Via Active Noise Reduction Headset – [11](#)

EAR PROTECTORS

E-3 In-Flight Acoustic Exposure Studies and Mitigation Via Active Noise Reduction Headset – [11](#)

EARLY WARNING SYSTEMS

Satellites as Sentinels for Climate and Health – [70](#)

EARTH ATMOSPHERE

Reversing Flows and Heat Spike: Caused by Solar g-Modes? – [76](#)

The EUSO Mission – [215](#)

Validation of the Paramaterized Real-Time Ionospheric Specification Model (PRISM) – [87](#)

EARTH GRAVITATION

An Analysis of Gravity-Field Estimation Based on Intersatellite Dual-1-Way Biased Ranging – [86](#)

GRACE: Gravity Recovery and Climate Experiment – [86](#)

EARTH IONOSPHERE

Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field – [93](#)

Magnetosphere: Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field – [90](#)

EARTH MAGNETOSPHERE

Formation of the Magnetosphere and Magnetospheric Plasma Regime – [241](#)

Magnetosphere: Formation of the Magnetosphere and Magnetospheric Plasma Regime – [89](#)

Magnetosphere: Geomagnetic Storms – [90](#)

Magnetosphere: Space Weather Research with Computer Simulations – [89](#)

Magnetosphere: Transmission Line Model for the Ground Magnetic Disturbances – [90](#)

Orbit Design for Phase I and II of the Magnetospheric Multiscale Mission (MMS) – [87](#)

Review of the Communications Research Laboratory – [88](#)

EARTH OBSERVATIONS (FROM SPACE)

A Comparison of Techniques for Scheduling Fleets of Earth-Observing Satellites – [202](#)

Center of Excellence in Space Data and Information Sciences – [207](#)

EARTH OBSERVING SYSTEM (EOS)

A Visual Database System for Image Analysis on Parallel Computers and its Application to the EOS Amazon Project – [159](#)

EARTH ORBITS

A Role for Improved Angular Observations in Geosynchronous Orbit Determination – [17](#)

EARTH (PLANET)

Origin of the Earth and Moon – [213](#)

Simulation of Prebiotic Processing by Comet and Meteoroid Impact: Implications for Life on Early Earth and Other Planets – [236](#)

EARTH SCIENCES

Astrobiology: The Search for Life in the Universe – [112](#)

Automated Data Processing as an AI Planning Problem – [69](#)

Center of Excellence in Space Data and Information Sciences – [207](#)

Global Weather Prediction and High-End Computing at NASA – [101](#)

The Laboratory for Terrestrial Physics – [208](#)

Working Toward a Healthy Planet – [135](#)

EARTH SURFACE

ICESat: Ice, Cloud, and Land Elevation Satellite – [94](#)

Transmission Line Model for Ground Magnetic Disturbances – [92](#)

EARTH TIDES

Possible Stick-Slip Mechanism for Whilans Ice Stream – [92](#)

EARTH-MOON SYSTEM

Origin of the Earth and Moon – [213](#)

EARTHQUAKES

Proceedings of the 2001 Earthquake Engineering Symposium for Young Researchers – [73](#)

ECONOMIC ANALYSIS

Digital Economy, 2003 – [204](#)

ECONOMIC DEVELOPMENT

Spatial Information Technology Center at Fulton-Montgomery Community College – [201](#)

ECONOMICS

Mineral Commodity Summaries, 2001 – [25](#)

Performance and Economics of Catalytic Glow Plugs and Shields in Direct Injection Natural Gas Engines for the Next Generation Natural Gas Vehicle Program – [73](#)

EDUCATION

Breast Cancer Training Program – [130](#)

INSPIRE – [222](#)

EL NINO

Westerly Wind Events in the Eastern Indian Ocean as a Precursor to El Nino: A Case Study for the 2002-03 El Nino – [103](#)

ELASTIC PROPERTIES

Prostate Carcinoma Detection Using Combined Ultrasound, Elasticity, and Tissue Strain-Hardening Imaging – [126](#)

ELECTRIC AUTOMOBILES

Baseline Testing of the Club Car Carryall With Asymmetric Ultracapacitors – [53](#)

ELECTRIC CHARGE

Electrical Charging of the Clouds of Titan – [211](#)

ELECTRIC CONNECTORS

The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – [59](#)

ELECTRIC EQUIPMENT

Apparatus and Method for Calibrating Voltage Spike Waveforms – [55](#)

ELECTRIC FIELDS

Analytic Solution to the Problem of Aircraft Electric Field Mill Calibration – [162](#)

Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – [162](#)

Field-effect Flow Control in Polymer Microchannel Networks – [61](#)

Geomagnetic Storms – [240](#)

Magnetosphere: Transmission Line Model for the Ground Magnetic Disturbances – [90](#)

Stormtime Particle Energization with AMIE Potentials – [88](#)

What is the Electromagnetic Spectrum? What is Infrared? How was the Infrared Discovered? – [242](#)

ELECTRIC HYBRID VEHICLES

Parallel Hybrid-Electric Sport Utility Vehicle-FutureTruck 2003 – [83](#)

ELECTRIC MOTOR VEHICLES

Cold-Start and Warm-Up Driveability Performance of Hybrid Electric Vehicles Using Oxygenated Fuels: Piggyback Project to the Volatility Group Intermediate -Temperature Program (CM-138-02) – [23](#)

Parallel Hybrid-Electric Sport Utility Vehicle-FutureTruck 2003 – [83](#)

ELECTRIC PROPULSION

50 KW Class Krypton Hall Thruster Performance – [21](#)

Combining Electric and Sail Propulsion for Interplanetary Sample Return – [60](#)

Investigation of Low-Voltage/High-Thrust Hall Thruster Operation – [21](#)

ELECTRICAL ENGINEERING

Periodica Polytechnica Electrical Engineering, Volume 46, No. 1-2, 2002 – [57](#)

ELECTRICAL PROPERTIES

Tribometric Optical and Electrical Properties of Sputtered Quasicrystalline – 29

ELECTRICAL RESISTANCE

Tribometric Optical and Electrical Properties of Sputtered Quasicrystalline – 29

ELECTRICITY

The Potential for solar Heat for Industrial Processes: A Preliminary Study of Swedish Possibilities – 80

ELECTROCHEMICAL CAPACITORS

Baseline Testing of the Club Car Carryall With Asymmetric Ultracapacitors – 53

ELECTRODYNAMICS

Stormtime Particle Energization with AMIE Potentials – 88

ELECTROLYTES

Stimuli-Responsive Polymers with Enhanced Efficiency in Reservoir Recovery Processes. Semiannual Progress Report for Work Performed September 1, 2001 through February 28, 2002 – 26

ELECTROMAGNETIC INTERFERENCE

Protections Against HPM Front-Door Coupling: A Survey of Commercial Limiters – 53

ELECTROMAGNETIC PULSES

X-Ray Sources for the Triggering of Electromagnetic Pulses from Isomeric Materials – 185

ELECTROMAGNETIC RADIATION

Electromagnetics Laboratory Annual Report 2002 – 172

What is the Electromagnetic Spectrum? What is Infrared? How was the Infrared Discovered? – 242

ELECTROMAGNETIC SPECTRA

The Optical Telescope – 213

ELECTROMAGNETIC WAVE FILTERS

S-Shaped Magnetic Macroparticle Filter for Cathodic ARC Deposition – 44

ELECTROMAGNETISM

Closed Form Solutions of Maxwell's Equations in the Computer Age – 140

ELECTROMECHANICS

A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188

ELECTRON ACCELERATORS

Radiation Protection at High-Energy Electron Accelerators – 48

ELECTRON BEAMS

SLAC Polarized Electron Source and Beam for E-158 – 199

Summary Report of Working Group 4: Electron Beam Driven Concepts – 198

ELECTRON CYCLOTRON HEATING

Maturing ECRF Technology for Plasma Control – 196

ELECTRON EMISSION

Emission Measurements from a Laser Driven Electron Injector – 187

Measurement of the total Cross Section for (positon)(Electron) at square root of $5=10.52$ GeV – 170

ELECTRON IMPACT

Dissociative Ionization and Product Distributions of Benzene and Pyridine by Electron Impact – 38

Scaling of Cross Sections for Ion-Atom Impact Ionization – 35

ELECTRON MICROSCOPES

Presolar Grains of Star Dust: Astronomy Studied with Microscopes – 225

ELECTRON TRANSFER

Biological Controls on the Precipitation of Chromium in Harbor Sediments – 33

ELECTRONIC COMMERCE

Digital Economy, 2003 – 204

ELECTRONIC EQUIPMENT

A Base for the Construction of a Calibration Current Source – 56

ELECTRONIC MAIL

Contract Representation for Run-Time Monitoring and Enforcement – 138

Model Checking Correctness Properties of Electronic Contracts – 139

ELECTRONIC MODULES

Amateur Radio on the International Space Station - Phase 2 Hardware System – 61

ELECTRONS

Combining Electron With Intensity Modulated Photon Beams for Breast Cancer – 123

Improved Conservation Properties for Particle-in-cell Simulations with Kinetic Electrons – 194

ELECTRO-OPTICS

Instrumentation Facility for the Evaluation of Photonic and Opto-Electronic Materials – 59

ELECTROSTATIC PROBES

Electrostatic Probe with Shielded Probe Insulator Tube for Low Disturbing Plasma Measurements in Hall Thrusters – 195

S-Shaped Magnetic Macroparticle Filter for Cathodic ARC Deposition – 44

ELECTROSTATICS

Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – 42

Electrostatic Image Theory for the Anisotropic Boundary – 172

Electrostatic Image Theory for Two Intersecting Conducting Spheres – 173

Genesis Solar-Wind Sample Return Mission: The Materials – 237

ELECTROWEAK INTERACTIONS (FIELD THEORY)

Measurement of the Tau Lepton Lifetime – 171

EMBEDDING

Verification and Validation of Embedded Knowledge-Based Software Systems – 205

EMERGENCIES

Modeling and Analysis of Uncertain Time-Critical Tasking Problems (UTCTP) – 164

EMISSION SPECTRA

Emission Line Galaxies in the STIS Parallel Survey – 217

Experimental Characterization of Coherent, Radially-Sheared Zonal Flows in the DIII-D Tokamak – 63

EMISSION

National Emission Standards for Hazardous Air Pollutants Surface Coating of Metal Cans. Background Information for Final Standards. Summary of Public Comments and Responses – 83

RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – 241

EMITTANCE

Emission Measurements from a Laser Driven Electron Injector – 187

ENERGY CONSERVATION

Are the Energy Analysis (EA) and the Statistical Energy Analysis (SEA) compatible? – 164

Systems-Level Energy Audit for Main Complex, Construction Engineering Research Laboratory – 81

ENERGY CONSUMPTION

Compressed Air System Survey at Sierra Army Depot, CA – 81

Portable Physical Activity Monitors for Measuring Energy Metabolism in ROTC Cadets – 121

Systems-Level Energy Audit for Main Complex, Construction Engineering Research Laboratory – 81

ENERGY CONVERSION EFFICIENCY

Hybrid Nanorod-Polymer Solar Cell – 80

ENERGY CONVERSION

Bromine Safety – 81

High Temperature Fusion Reactor Cooling Using Brayton Cycle Based Partial Energy Conversion – 22

ENERGY GAPS (SOLID STATE)

Tri-Services Workshop on Process Induced Defects in Wide Bandgap Semiconductors – 59

ENERGY STORAGE

Bromine Safety – 81

ENERGY TECHNOLOGY

Fuel Cells for Space Science Applications – 79

ENERGY TRANSFER

ELM Particle and Energy Transport in the SOL and Divertor of DIII-D – 191

- End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – 80
- Localized Flow Control in High Speed Flows Using Laser Energy Deposition – 5
- Photon-Counting Single-Molecule Spectroscopy for Studying Conformational Dynamics and Macromolecular Interactions – 32
- Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – 192
- ENGINE DESIGN**
- Structural Evaluation of Exo-Skeletal Engine Fan Blades – 75
- ENGINEERS**
- Standardized UXO Technology Demonstration Site Blind Grid Scoring Record No. 50. Site Location: Aberdeen Proving Ground – 71
- ENTRAINMENT**
- Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – 85
- ENTROPY**
- An Equation for Moist Entropy in a Precipitating and Icy Atmosphere – 102
- ENVIRONMENT EFFECTS**
- Damage by Impact: The Case at Meteor Crater, Arizona – 209
- ENVIRONMENT PROTECTION**
- Characterization of Soluble Organic in Produced Water – 35
- Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation – 29
- PAIRS, The GIS-Based Incident Response System for Pennsylvania, and NASA – 91
- ENVISAT-1 SATELLITE**
- Validation of Envisat Ozone Data Products using Satellite and Ground Based Data – 96
- ENZYME ACTIVITY**
- Investigations of Thaxtomin Biosynthesis – 115
- MCAK and Stathmin Upregulation in Breast Cancer Cells: Etiology and Response to Pharmacologic Reagents – 108
- ENZYMES**
- The Thiamin Pyrophosphate Motif – 132
- EOS DATA AND INFORMATION SYSTEM**
- High-Performance Input/Output Systems for Parallel Computers – 142
- EPIDEMIOLOGY**
- Training Grant in Epidemiology and Prevention of Breast Cancer – 114
- EQUATIONS OF STATE**
- Spreadsheet Accumulator Sizing for Hybrid Hydraulic Applications Using the Benedict-Webb-Rubin Equation of State – 64
- EROSION**
- Investigation of the Erosion Characteristics of a Laboratory Hall Thruster – 22
- ESTIMATES**
- Analytic Solution to the Problem of Aircraft Electric Field Mill Calibration – 162
- ESTROGENS**
- In Vivo Transcriptional Activation of Estrogen Receptor Target Genes: Differential Regulation in Mammary Gland Uterus and Bone – 118
- Leptin (Obesity Protein) and Breast Cancer Metastasis – 129
- Studies on the Novel Anticancer Agents Metabolically Formed from 17-Beta-Estradiol – 123
- The Role of N-CoR During Normal Mammary Gland Development – 109
- ETHANE**
- Thermal Vacuum Testing of Swift XRT Ethane Heat Pipes – 65
- ETHNIC FACTORS**
- Prostate Cancer in Nigerians, Jamaicans and U.S. Blacks – 205
- ETHYL ALCOHOL**
- Cold-Start and Warm-Up Driveability Performance of Hybrid Electric Vehicles Using Oxygenated Fuels: Piggyback Project to the Volatility Group Intermediate -Temperature Program (CM-138-02) – 23
- EUCLIDEAN GEOMETRY**
- de Sitter Vacua in String Theory – 168
- Stringy Resolutions of Null Singularities – 179
- EULER EQUATIONS OF MOTION**
- Dynamic RCS: A Geometrical/Eulerian Approach to Computing High Frequency Radar Cross Sections – 165
- EUROPA**
- Europa and Titan: Oceans in the Outer Solar System? – 209
- Europa's Salty Surface – 226
- Possible Life in a European Ocean – 138
- The Europa Scene in the Voyager-Galileo Era – 232
- EVALUATION**
- Instrumentation Facility for the Evaluation of Photonic and Opto-Electronic Materials – 59
- Quick Assessment of the Navy Mark V CBR Respirator After 13 Years in Storage – 137
- EVAPORATION**
- Tagging Water Sources in Atmospheric Models – 102
- EVOKED RESPONSE (PSYCHOPHYSIOLOGY)**
- Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – 162
- EXCITATION**
- Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – 18
- EXHAUST EMISSION**
- Reduction of the Noise and Gas Emissions Generated by the Activity of the Swedish Air Force Preliminary Studies – 83
- Restricting the Use of Reverse Thrust as an Emissions Reduction Strategy (Revised) – 85
- EXHAUST GASES**
- Reduction of the Noise and Gas Emissions Generated by the Activity of the Swedish Air Force Preliminary Studies – 83
- EXO BIOLOGY**
- Astrobiology: The Search for Life in the Universe – 112
- EXPEDITIONS**
- Searching Antarctic Ice for Meteorites – 228
- EXPERIMENT DESIGN**
- Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – 189
- EXPERIMENTATION**
- A Comparison of Techniques for Scheduling Fleets of Earth-Observing Satellites – 202
- EXPERT SYSTEMS**
- An Expert System for the Development of Efficient Parallel Code – 152
- Expert Seeker: A People-Finder Knowledge Management System – 159
- EXTRACTION**
- Analyses of $D + K(\sup O)(\sub S)$ and $D + K(\sup O)(\sub S)\pi$ – 179
- Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25
- EXTRATERRESTRIAL LIFE**
- Life on Mars? – 230
- Organic Compounds in Martian Meteorites May be Terrestrial Contaminants – 228
- Possible Life in a European Ocean – 138
- Simulation of Prebiotic Processing by Comet and Meteoroid Impact: Implications for Life on Early Earth and Other Planets – 236
- EXTRATERRESTRIAL OCEANS**
- Europa and Titan: Oceans in the Outer Solar System? – 209

EXTREME ULTRAVIOLET RADIATION

RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – 241

EYE MOVEMENTS

Dynamic Measurement of the Operator for Future System Development – 11

F-15 AIRCRAFT

Observations and Calibrations of DMSP F15 SSM Data December 1999 - October 2000 – 48

F-16 AIRCRAFT

Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – 64

FABRICATION

Diamond Semiconductors Operate at Highest Frequency Ever: A Step Closer to Diamond Devices for Communication Satellites, Broadcasting Stations, and Radars – 54

Field-effect Flow Control in Polymer Microchannel Networks – 61

Investigation of Low-Voltage/High-Thrust Hall Thruster Operation – 21

Parameter Comparison for Low-Noise MoAu TES Bolometers – 74

Temperature Swing Adsorption Compressor Development – 74

FABRY-PEROT INTERFEROMETERS

A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188

FAILURE ANALYSIS

Failure Prediction of Underwater Structures - Subdomain Decomposition and Meshfree Methods – 169

FAN BLADES

Structural Evaluation of Exo-Skeletal Engine Fan Blades – 75

FATIGUE LIFE

Review of Aeronautical Fatigue Investigations in Sweden During the Period June 2001 to April 2003 – 10

FATIGUE TESTS

Screening Test Results of Fatigue Properties of Type 316LN Stainless Steel in Mercury – 41

FEEDBACK CONTROL

Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – 195

FEEDBACK

Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – 195

FEMALES

Genetic Influences on Toxicity and Prognosis in Women Treated With Breast-Conserving Surgery and Radiation Therapy – 118

FERMIONS

Self-Energy of Improved Staggered Quarks – 199

WOPPER, Version 1.1: A Monte Carlo Event Generator for Four Fermion Production at LEP-II and Beyond – 166

FERROMAGNETIC MATERIALS

Passive Superconducting Shielding: Experimental Results and Computer Models – 197

Periodica Polytechnica Electrical Engineering, Volume 46, No. 1-2, 2002 – 57

FIBER OPTICS

Design and Simulation of Transmission Properties of Hollow Bragg Fibers Fabricated from Omnidirectionally Reflective Composite Dielectric Materials – 58

Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature – 186

FIBROBLASTS

The Role of a FGF-Binding Protein in Breast Cancer – 124

The Roles of FGF-2 TGF Beta and TGF Beta Receptor 2 in Breast Cancer Dormancy – 128

FIGHTER AIRCRAFT

Model of Unsteady Aerodynamic Coefficients of a Delta Wing Aircraft at High Angles of Attack – 6

FILLETS

Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – 6

FILM COOLING

The Importance of Cooling Technology in Propulsion and Power Systems – 13

FINANCIAL MANAGEMENT

Information Technology: Architecture Needed to Guide NASA's Financial Management Modernization – 15

FINITE DIFFERENCE THEORY

A Sounding Rocket Attitude Determination Algorithm Suitable for Implementation Using Low Cost Sensors – 161

FINITE ELEMENT METHOD

KRYP, a Finite Element Program for Crystal Plasticity – 27

FINITE VOLUME METHOD

Global Weather Prediction and High-End Computing at NASA – 101

FISSION

Overview of Non-nuclear Testing of the Safe, Affordable 30-kW Fission Engine, Including End-to-End Demonstrator Testing – 22

FLIGHT CONTROL

Advanced Guidance and Control for Hypersonics and Space Access – 16

FLIGHT MANAGEMENT SYSTEMS

Design Issues Associated with Full-Scale Application of Active Control of Vortex Flows – 8

FLIGHT OPERATIONS

Digital Avionics – 12

FLIGHT PLANS

Observations on SOFIA Observation Scheduling: Search and Inference in the Face of Discrete and Continuous Constraints – 202

FLIGHT STABILITY TESTS

Overview of Non-nuclear Testing of the Safe, Affordable 30-kW Fission Engine, Including End-to-End Demonstrator Testing – 22

FLOATING

Diagnostic Setup for Characterization of Near-Anode Processes in Hall Thrusters – 12

FLOODS

Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – 100

FLOW CHARACTERISTICS

Real-Time Adaptive Control of Flow-Induced Cavity Tones – 62

FLOW DISTRIBUTION

An Assessment of CFD Effectiveness for Vortex Flow Simulation to Meet Preliminary Design Needs – 8

An Experimental Investigation of Leading Edge Vortices and Passage to Stall of Nonslender Delta Wings – 4

An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack – 6

Numerical Modelling of Vortex Flow Instabilities and Interactions – 8

PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – 3

Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – 66

Support of Integrated Health Management (IHM) through Automated Analyses of Flowfield-Derived Spectrographic Data – 23

Unsteady Flows and Airfoil-Vortex Interaction – 6

Unsteady RANS Calculations for the GFSI Bump Preliminary Study Using EURANUS 5.3 – 1

Vortex Effects in the Dynamics of Underwater Weapons – 153

FLOW MEASUREMENT

Hydrotechnics in Situ Flow Sensor – 64

Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster – 189

FLOW REGULATORS

Field-effect Flow Control in Polymer Microchannel Networks – 61

FLOW VISUALIZATION

Technical Report of National Aerospace Laboratory: Transition Process of Boundary Layers on a Low-Speed Wind-Tunnel Contraction Wall – 2

FLUID DYNAMICS

Are the Energy Analysis (EA) and the Statistical Energy Analysis (SEA) compatible? – 164

Instrumentation and Equipment Upgrades to Improve Acoustical and Fluid Dynamic Measurements in the Garfield Thomas Water Tunnel – 48

Localized Flow Control in High Speed Flows Using Laser Energy Deposition – 5

FLUID FLOW

A New Modular Approach for Tightly Coupled Fluid/Structure Analysis – 63

Nonlinear Dynamics and Ergodic Theory Methods in Control – 64

FLUTTER

Effects of Blade Sweep on V-22 Whirl Flutter and Loads – 10

FOOD INTAKE

Investigating the Partitioning of Inorganic Elements Consumed by Humans between the Various Fractions of Human Wastes: An Alternative Approach – 33

FORCED VIBRATION

Computational Methods for Dynamic Stability and Control Derivatives – 14

FORCE

Computational Methods for Dynamic Stability and Control Derivatives – 14

FORECASTING

Recent Observing System Simulation Experiments at the NASA DAO – 101

Spatial Information Technology Center at Fulton-Montgomery Community College – 201

FOREST FIRES

Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – 85

FORM FACTORS

Measurement of the Overline Beta DI Overline n_V Partial Width and Form Factor Parameters – 196

Measurements of the Meson-Photon Transition Form Factors of Light Pseudoscalar Mesons at Large Momentum Transfer – 183

FORMATION FLYING

ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – 19

FOSSILS

Rules for Identifying Ancient Life – 76

FRACTURE MECHANICS

Review of Aeronautical Fatigue Investigations in Sweden During the Period June 2001 to April 2003 – 10

FRACTURE STRENGTH

Effect of Applied Pressure During Feeding of Critical Cast Aluminum Alloy Components with Particular Reference to Fatigue Resistance – 40

FRACTURES (MATERIALS)

Bands on Europa – 231

FRAGMENTATION

Study of Gluon versus Quark Fragmentation in Upsilon $gg(\gamma)$ and $(\text{positron})(\text{electron}) q\bar{q}(\gamma)$ gamma square root of S equals 10 GeV – 184

FREE ATMOSPHERE

Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – 97

FREE ELECTRON LASERS

Complete Characterization of a Chaotic Optical Field using a High-Gain Self-Amplified Free-Electron Laser – 188

Frequency Chirped SASE FEL – 178

Perturbation Expansion for High-Gain Free-Electron Laser Saturation – 72

FREQUENCIES

Green Bank Telescope 290 to 395 MHz Feed Analysis and Modification for Operation in the 140 to 175 MHz Band – 60

Interaction of Neutral Beam Injected Fast Ions with Ion Cyclotron Resonance Frequency Waves – 180

FUEL CELLS

Fuel Cells for Space Science Applications – 79

FUEL CONSUMPTION

Consumer Views on Transportation and Energy – 85

FUEL CONTAMINATION

Handbook for Remediation of Petroleum-Contaminated Sites (A Risk-Based Strategy) – 47

FUEL TANKS

Handbook for Remediation of Petroleum-Contaminated Sites (A Risk-Based Strategy) – 47

FUSION PROPULSION

Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – 189

FUSION REACTORS

High Temperature Fusion Reactor Cooling Using Brayton Cycle Based Partial Energy Conversion – 22

GALACTIC EVOLUTION

An Empirical Decomposition of Near-IR Emission into Galactic and Extragalactic Components – 216

Emission Line Galaxies in the STIS Parallel Survey – 217

GALACTIC STRUCTURE

The Center of the Galaxy – 214

GALAXIES

Fun Times with Cosmic Rays – 221

Validation Report for the Celestial Background Scene Descriptor (CBSD) stellar Point Sources Model CBSKY4 – 211

GAME THEORY

Pre-Game-Theory Based Information Technology (GAMBIT) Study – 165

GAMMA RAY ASTRONOMY

Future Facilities for Gamma-Ray Pulsar Studies – 224

The Gamma-Ray Burst Next Door – 220

GAMMA RAY BURSTS

Gamma-Ray Bursts and Cosmology – 224

The Gamma-Ray Burst Next Door – 220

GAMMA RAY OBSERVATORY

Future Facilities for Gamma-Ray Pulsar Studies – 224

GAMMA RAY TELESCOPES

Future Facilities for Gamma-Ray Pulsar Studies – 224

Use of HepRep in GLAST – 218

GAMMA RAYS

Gamma-Ray Blazar Content of the Northern Sky – 223

Gamma-ray Polarimetry – 224

GAS CHROMATOGRAPHY

Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – 36

Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37

GAS GIANT PLANETS

The Stability of Orbital Configurations and the Ultimate Configurations of Planetary and Satellite Systems – 215

The Sun – 213

GAS TURBINE ENGINES

The Importance of Cooling Technology in Propulsion and Power Systems – 13

GAS TURBINES

Heat Transfer Modelling in Gas Turbine Stage – 13

Technical Evaluation Report Part B - Heat Transfer and Cooling in Propulsion and Power Systems – 13

GASEOUS ROCKET PROPELLANTS

50 KW Class Krypton Hall Thruster Performance – 21

GASOLINE

Great Lakes Binational Toxics Strategy
U.S. Challenge on Alkyl-lead: Report on
Use of Alkyl-lead in Automotive Gaso-
line – 82

GATES (CIRCUITS)

Logic Synthesis Avoiding State Space
Explosion – 139

GEARS

Modified Involute Helical Gears: Comput-
erized Design, Simulation of Meshing
and Stress Analysis – 147

GENE EXPRESSION

Metastasis Genes in Breast Cancer Me-
tastasis to Bone – 117

P53 Regulation of Uridine Phosphory-
lase Activity, Pyrimidine Salvage Path-
way and Their Effects on Breast Cancer
Therapy – 109

The Prostate Expression Database
(PEDB) – 106

GENE THERAPY

Genetically Engineered Autologous Cells
for Antiangiogenic Therapy of Breast
Cancer – 119

GENERAL OVERVIEWS

Architectural Design for the Global Legal
Information Network – 203

NASA's Photon-Counting SLR2000 Sat-
ellite Laser Ranging System: Progress
and Applications – 72

Structures and Materials Technologies
for Extreme Environments Applied to Re-
usable Launch Vehicles – 75

GENESIS MISSION

Genesis Solar-Wind Sample Return Mis-
sion: The Materials – 237

The Genesis Mission: An Over-
view – 236

The Genesis Solar Wind Sample Return
Mission – 236

GENES

A Molecular Model for Repression of
BRCA-1 Transcription by the Aryl Hydro-
carbon Receptor – 105

Determining Effects of Genes, Environ-
ment, and Gene X Environment Interac-
tion That Are Common to Breast and
Ovarian Cancers Via Bivariate Logistic
Regression – 125

Functional Analysis of Interactions Be-
tween 53BP1, BRCA1 and p53 – 105

Genes Differentially Expressed at the
Transition from Premalignancy to Carci-
noma – 106

Improving Retroviral Vectors for Gene
Therapy of Prostate Cancer – 133

Metastasis Genes in Breast Cancer Me-
tastasis to Bone – 117

Novel Lishmania and Malaria Potassium
Channels: Candidate Therapeutic Tar-
gets – 110

Recombinational Repair Genes and
Breast Cancer Risk – 112

The Role of S100A7/RANBPM Interac-
tion in Human Breast Cancer – 117

GENETIC ALGORITHMS

A Comparison of Techniques for Sched-
uling Fleets of Earth-Observing Satel-
lites – 202

A Hierarchical and Distributed Approach
for Mapping Large Applications to Het-
erogeneous Grids using Genetic Algo-
rithms – 156

GENETICS

Cooperative Interactions During Human
Mammary Epithelial Cell Immortaliza-
tion – 134

Development of an erbB Antago-
nist – 124

Genes Differentially Expressed at the
Transition from Premalignancy to Carci-
noma – 106

Genetic Influences on Toxicity and Prog-
nosis in Women Treated With Breast-
Conserving Surgery and Radiation
Therapy – 118

Genetic Requirements for the Transfor-
mation of Human Cells – 117

GENOME

The Genome of *Bacillus cereus* 14579: A
Local Analysis – 119

GEODESY

GRACE: Gravity Recovery and Climate
Experiment – 86

Mapping Charting and Geodesy Branch.
Abstracts of Publications 2000-
2002 – 78

GEOGRAPHIC DISTRIBUTION

Precipitation Chemistry Studies in India:
A Search for Regional Patterns – 100

GEOGRAPHIC INFORMATION SYSTEMS

Geodata Modeling and Query in Geo-
graphic Information Systems – 144

Moving NASA Remote Sensing Data to
the GIS Environment for Health Stud-
ies – 77

PAIRS, The GIS-Based Incident Re-
sponse System for Pennsylvania, and
NASA – 91

Time Synchronization of a TDA-Based
Position Finding System – 61

GEOLOGICAL FAULTS

Bands on Europa – 231

GEOLOGICAL SURVEYS

Europa's Salty Surface – 226

Meteorites from Mars, Rocks from
Canada – 231

The Europa Scene in the Voyager-
Galileo Era – 232

GEOLOGY

Big Mountain, Big Landslide on Jupiter's
Moon, Io – 232

GEOMAGNETIC LATITUDE

Factors Affecting the Latitudinal Location
of the Intertropical Convergence Zone in
a GCM – 91

GEOMAGNETISM

Geomagnetic Storms – 240

New Data, New Ideas, and Lively Debate
about Mercury – 212

Solar and Solar Wind: Interplanetary
Magnetic Flux Ropes – 89

Transmission Line Model for Ground
Magnetic Disturbances – 92

GEOMETRY

Cartesian and Adaptive Methods for
Complex Geometries – 162

Geometry, Topology and String
Theory – 175

Noncommutative Geometry in M-Theory
and Conformal Field Theory – 168

GEOPHYSICS

Astrobiology: The Search for Life in the
Universe – 112

Atmospheric Measurements by the Geo-
science Laser Altimeter System: Initial
Results – 88

ICESat's Laser Measurements of Polar
Ice, Atmosphere, Ocean, and
Land – 103

Magnetosphere: Geomagnetic
Storms – 90

Observations of Dust Using the NASA
Geoscience Laser Altimeter System
(GLAS): New New Measurements of
Aerosol Vertical Distribution From
Space – 88

PAIRS, The GIS-Based Incident Re-
sponse System for Pennsylvania, and
NASA – 91

The Martian Interior – 230

GEOSYNCHRONOUS ORBITS

A Role for Improved Angular Observa-
tions in Geosynchronous Orbit Determi-
nation – 17

GLACIOLOGY

Glaciology in Antarctica – 100

Possible Stick-Slip Mechanism for Whil-
lans Ice Stream – 92

GLOBAL POSITIONING SYSTEM

An Analysis of Gravity-Field Estimation
Based on Intersatellite Dual-1-Way Bi-
ased Ranging – 86

Satellites as Sentinels for Climate and
Health – 70

GLOVES

NASA Virtual Glovebox: An Immersive
Virtual Desktop Environment for Training
Astronauts in Life Science Experi-
ments – 19

GLOW DISCHARGES

Coating and Mandrel Effects on Fabrica-
tion of Glow Discharge Polymer NIF
Scale Indirect Drive Capsules – 177

- Recent Progress in Fabrication of High-Strength Glow Discharge Polymer Shells by Optimization of Coating Parameters – 177
- GLUONS**
Study of Gluon versus Quark Fragmentation in Upsilon $\gamma\gamma$ and (positron)(electron) $q\bar{q}$ gamma square root of S equals 10 GeV – 184
Two-Loop Helicity Amplitudes for Quark-Gluon Scattering in QCD and Gluino-Gluon Scattering in Supersymmetric Yang-Mills Theory – 197
- GOLD**
Parameter Comparison for Low-Noise MoAu TES Bolometers – 74
- GONADS**
Impact of Breast Cancer Treatments on Gonadal Function and Reproduction Health – 125
- GRAPH THEORY**
Plan-graph Based Heuristics for Conformant Probabilistic Planning – 141
- GRAPHITE**
Electrical Charging of the Clouds of Titan – 211
- GRAVITATIONAL COLLAPSE**
More Hidden Black Hole Dangers – 229
- GRAVITATIONAL FIELDS**
An Analysis of Gravity-Field Estimation Based on Intersatellite Dual-1-Way Biased Ranging – 86
Braneless Black Holes – 174
GRACE: Gravity Recovery and Climate Experiment – 86
Three-Gorge Reservoir: A 'Controlled Experiment' for Calibration/Validation of Time-Variable Gravity Signals Detected from Space – 210
- GRAVITATION**
Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – 97
ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – 19
- GRAVITY PROBE B**
Brief History of Gyroscopes – 178
- GRID GENERATION (MATHEMATICS)**
Failure Prediction of Underwater Structures - Subdomain Decomposition and Meshfree Methods – 169
- GROUND BASED CONTROL**
Space Weather: The Invisible Foe – 209
- GROUND SUPPORT EQUIPMENT**
Three Corner Sat Constellation – 16
- GROUND TESTS**
Space Instruments: General Considerations – 20
Thermal Vacuum Testing of Swift XRT Ethane Heat Pipes – 65
- GROUND WATER**
Handbook for Remediation of Petroleum-Contaminated Sites (A Risk-Based Strategy) – 47
Hydrotechnics in Situ Flow Sensor – 64
- GROWTH**
Role of E-Cadherin Homophilic Contacts in the Inhibition of Cell Growth of Primary Breast Cells – 129
The Role of a FGF-Binding Protein in Breast Cancer – 124
- GYROSCOPES**
Brief History of Gyroscopes – 178
- HADRONS**
Observation of Exclusive Two-body B Decays to Kaons and Pions – 183
Search for Color-Suppressed B Hadronic Decay Processes with CLEO – 180
Structure Function Subgroup Summary – 170
- HAFNIUM OXIDES**
Thermal Conductivity and Stability of $\text{HfO}_2\text{-Y}_2\text{O}_3$ and $\text{La}_2\text{Zr}_2\text{O}_7$ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – 25
- HALL EFFECT**
Diagnostic Setup for Characterization of Near-Anode Processes in Hall Thrusters – 12
- HALL THRUSTERS**
50 KW Class Krypton Hall Thruster Performance – 21
Diagnostic Setup for Characterization of Near-Anode Processes in Hall Thrusters – 12
Investigation of Low-Voltage/High-Thrust Hall Thruster Operation – 21
Investigation of the Erosion Characteristics of a Laboratory Hall Thruster – 22
- HALOS**
Eruption of a Multiple-Turn Helical Magnetic Flux Tube in a Large Flare: Evidence for External and Internal Reconnection that Fits the Breakout Model of Solar Magnetic Eruptions – 238
X-ray Haloes and Scattering by Interstellar Grains – 236
- HAMILTONIAN FUNCTIONS**
Symplecticity in Beam Dynamics: An Introduction – 171
- HEALTH**
Predictors of Navy Attrition. II. A Demonstration of Potential Usefulness for Screening – 111
Satellites as Sentinels for Climate and Health – 70
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
UH - USA Agreement - A Telemedicine Research Proposal – 110
Working Toward a Healthy Planet – 135
- HEART RATE**
The War Fighter's Stress Response: Telemetric and Noninvasive Assessment – 121
- HEAT FLUX**
Mean COAMPS Air-Sea Fluxes Over the Mediterranean During 1999 – 48
- HEAT MEASUREMENT**
Ece Radiometer Upgrade on the DIII-D Tokamak – 194
- HEAT PIPES**
Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – 20
Thermal Vacuum Testing of Swift XRT Ethane Heat Pipes – 65
- HEAT TRANSFER**
Heat Transfer Modelling in Gas Turbine Stage – 13
HVOF Application of Nickel and Nickel Alloy to Tungsten Heavy Alloy for Jacketed Penetrators – 40
Technical Evaluation Report Part B - Heat Transfer and Cooling in Propulsion and Power Systems – 13
Thermal Vacuum Testing of Swift XRT Ethane Heat Pipes – 65
- HEATING**
Coronal Heating, Spicules, and Solar-B – 238
- HEAVY IONS**
Comparison of Quantum Mechanical and Classical Trajectory Calculations of Cross Sections for Ion-Atom Impact Ionization of Negative- and Positive-Ions for Heavy Ion Fusion Applications – 193
- HELICES**
Determination of the Michel Parameters and the tau Neutrino Helicity in tau Decay – 200
Two-Loop Helicity Amplitudes for Quark-Gluon Scattering in QCD and Gluino-Gluon Scattering in Supersymmetric Yang-Mills Theory – 197
- HELICOPTERS**
Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure – 3
- HETEROGENEITY**
A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – 156
Automated Data Processing as an AI Planning Problem – 69
- HEURISTIC METHODS**
Modeling and Analysis of Uncertain Time-Critical Tasking Problems (UTCTP) – 164
Plan-graph Based Heuristics for Conformant Probabilistic Planning – 141
Scheduling in the Face of Uncertain Resource Consumption and Utility – 202

- Task Assignment Heuristics for Parallel and Distributed CFD Applications – 65
- HIGGS BOSONS**
Weakly-Coupled Higgs Bosons and Precision Electroweak Physics – 170
- HIGH ENERGY INTERACTIONS**
Structure Function Subgroup Summary – 170
Use of HepRep in GLAST – 218
WIRED: World-Wide Web Interactive Remote Event Display – 142
- HIGH SPEED**
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 186
Localized Flow Control in High Speed Flows Using Laser Energy Deposition – 5
Vortex Flow Dilemmas and Control on Wing Planforms on High Speed – 4
- HIGH TEMPERATURE GASES**
More Hidden Black Hole Dangers – 229
Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – 206
- HIGH TEMPERATURE NUCLEAR REACTORS**
Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy – 35
- HIGH TEMPERATURE SUPERCONDUCTORS**
Development of Nickel Alloy Substrates for Y-Ba-Cu-O Coated Conductor Applications – 38
Flux-Pinning of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ High T_c Superconducting Tapes Utilizing $(\text{Sr,Ca})_{14}\text{Cu}_{24}\text{O}_{(41+\delta)}$ and $\text{Sr}_2\text{CaAl}_2\text{O}_6$ Defects – 35
Properties of Doped Bi-Based Superconductors – 197
- HIGH TEMPERATURE**
Advanced High Performance Solid Wall Blanket Concepts – 195
High Temperature Fusion Reactor Cooling Using Brayton Cycle Based Partial Energy Conversion – 22
Thermal Conductivity and Stability of $\text{HfO}_2\text{-Y}_2\text{O}_3$ and $\text{La}_2\text{Zr}_2\text{O}_7$ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – 25
- HIGH THRUST**
Investigation of Low-Voltage/High-Thrust Hall Thruster Operation – 21
- HIGH VOLTAGES**
Helsinki University of High Voltage Institute Annual Report 2002 – 56
- HISTORIES**
1997 Apparition of Comet Hale-Bopp Historical Comet Observations – 233
- Kepler's Laws of Planetary Motion – 221
The Center of the Galaxy – 214
- HOLE GEOMETRY (MECHANICS)**
Calculation and Optimization of Laser Acceleration in Vacuum – 175
Ring Around the Black Hole – 229
- HOLES (MECHANICS)**
Calculation and Optimization of Laser Acceleration in Vacuum – 175
- HOLOGRAPHY**
Brane Gas Cosmology, M-Theory and Little String Theory – 234
Electronic Imaging: Propagation, Retrieval, Recognition – 70
Holographic Optical Storage Using Photorefractive Polymers – 187
- HORIZONTAL DISTRIBUTION**
NASA's Scientific Agenda for GPM Mission – 96
- HORMONES**
Leptin (Obesity Protein) and Breast Cancer Metastasis – 129
Role of Nuclear Receptor Coactivators, AIB-1 and SRC-1, in the Development of Breast Cancer – 114
The War Fighter's Stress Response: Telemetric and Noninvasive Assessment – 121
- HOT SURFACES**
Remote Sensing – 78
- HUBBLE SPACE TELESCOPE**
Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – 70
- HUMAN BEINGS**
Dynamic Tissue Culture from Prostate Biopsy Specimens as a model for Predicting Tumor Radiosensitivity to Ionizing Radiation Treatment – 126
Tuberculosis Infection Among Young Adults Enlisting in the USA Navy – 130
- HUMAN FACTORS ENGINEERING**
Development of an Instrument for Measuring Team Performance Potential – 137
Dynamic Measurement of the Operator for Future System Development – 11
- HUMAN PERFORMANCE**
Compilation of Technical Papers Published Under Work Unit 72312501 (71844501) 'Acceleration Performance in Advanced Operational Systems,' 1985-2000 – 205
Development of an Instrument for Measuring Team Performance Potential – 137
- HUMAN WASTES**
Investigating the Partitioning of Inorganic Elements Consumed by Humans between the Various Fractions of Human Wastes: An Alternative Approach – 33
- HUMAN-COMPUTER INTERFACE**
NASA's MERBoard: An Interactive Collaborative Workspace Platform – 235
- HYBRID PROPULSION**
Cold-Start and Warm-Up Driveability Performance of Hybrid Electric Vehicles Using Oxygenated Fuels: Piggyback Project to the Volatility Group Intermediate Temperature Program (CM-138-02) – 23
- HYDRAULIC EQUIPMENT**
Laboratory Evaluation of Moisture Cure Urethane Coatings – 28
- HYDRAULIC TEST TUNNELS**
Instrumentation and Equipment Upgrades to Improve Acoustical and Fluid Dynamic Measurements in the Garfield Thomas Water Tunnel – 48
- HYDRAULICS**
Spreadsheet Accumulator Sizing for Hybrid Hydraulic Applications Using the Benedict-Webb-Rubin Equation of State – 64
- HYDRODYNAMICS**
Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – 66
Technical Evaluation Report, Part A - Vortex Flow and High Angle of Attack – 5
Vortex Effects in the Dynamics of Underwater Weapons – 153
- HYDROGEN ATOMS**
Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – 200
- HYDROGEN FUELS**
Initial Screening of Thermochemical Water-Splitting Cycles for High Efficiency Generation of Hydrogen Fuels Using Nuclear Power – 32
- HYDROGEN PEROXIDE**
Isothermal Microcalorimetric Evaluation of Compatibility of Proposed Injector Materials with High-Test Hydrogen Peroxide Propellant – 46
- HYDROGEN PRODUCTION**
Ceramic Membranes for Hydrogen Production from Coal – 44
Initial Screening of Thermochemical Water-Splitting Cycles for High Efficiency Generation of Hydrogen Fuels Using Nuclear Power – 32
Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy – 35
- HYDROGEN**
Dirty Ice on Mars – 229
The Sun – 213
- HYDROGRAPHY**
Mapping Charting and Geodesy Branch. Abstracts of Publications 2000-2002 – 78

HYDROLYSIS

Hydrolysis of Levinstein Mustard (H) – [36](#)

HYDROSTATICS

Pellissier H5 Hydrostatic Level – [184](#)

HYPERSONIC FLOW

Science and Technology Text Mining: Hypersonic and Supersonic Flow – [203](#)

HYPERVELOCITY IMPACT

Simulation of Prebiotic Processing by Comet and Meteoroid Impact: Implications for Life on Early Earth and Other Planets – [236](#)

HYPOTHESES

Association Between Offspring's hCG Genotype and Breast Cancer Risk in Mothers: A Novel Approach – [112](#)

ICE, CLOUD AND LAND ELEVATION SATELLITE

Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – [20](#)

Glaciology in Antarctica – [100](#)

ICESat: Ice, Cloud, and Land Elevation Satellite – [94](#)

ICESat's Laser Measurements of Polar Ice, Atmosphere, Ocean, and Land – [103](#)

ICELAND

Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – [97](#)

ICE

An Equation for Moist Entropy in a Precipitating and Icy Atmosphere – [102](#)

Bands on Europa – [231](#)

Dirty Ice on Mars – [229](#)

Glaciology in Antarctica – [100](#)

Ice on the Bone Dry Moon – [234](#)

Possible Stick-Slip Mechanism for Whilans Ice Stream – [92](#)

The Europa Scene in the Voyager-Galileo Era – [232](#)

IDENTIFYING

Rules for Identifying Ancient Life – [76](#)

IGNEOUS ROCKS

Big Mountain, Big Landslide on Jupiter's Moon, Io – [232](#)

IGNITION SYSTEMS

Performance and Economics of Catalytic Glow Plugs and Shields in Direct Injection Natural Gas Engines for the Next Generation Natural Gas Vehicle Program – [73](#)

ILLUSIONS

Measurements on Spatial Disorientation during Gondola Centrifugation – [136](#)

IMAGE ANALYSIS

A Visual Database System for Image Analysis on Parallel Computers and its Application to the EOS Amazon Project – [159](#)

IMAGE PROCESSING

Drug Discovery for Breast Cancer by Mirror-Image Display – [105](#)

Efficient Region Tracking and Target Position Estimation in Image Sequences using Kalman Filters – [69](#)

Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+ – [67](#)

IMAGE VELOCITY SENSORS

Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – [195](#)

IMAGERY

Conjugate Auroral Imagery – [91](#)

IMAGES

Electronic Imaging: Propagation, Retrieval, Recognition – [70](#)

Image Systems Using RFID Tag Positioning Information – [54](#)

NASA Virtual Glovebox: An Immersive Virtual Desktop Environment for Training Astronauts in Life Science Experiments – [19](#)

IMAGING SPECTROMETERS

Global Multispectral Cloud Retrievals from MODIS – [69](#)

Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – [104](#)

Scalability Analysis and Use of Compression at the Goddard DAAC and End-to-End MODIS Transfers – [144](#)

IMAGING TECHNIQUES

Prostate Carcinoma Detection Using Combined Ultrasound, Elasticity, and Tissue Strain-Hardening Imaging – [126](#)

IMMUNOASSAY

Marine Mammal Health: Development of Immunodiagnostic and Viral Diagnostic Methodologies and Reagents – [123](#)

IMPEDANCE

Calculation of the Coherent Synchrotron Radiation Impedance from a Wiggler – [173](#)

IMPINGEMENT

Investigation of Impinging Stream Vortex Chamber Concepts for Liquid Rocket Engine Applications – [23](#)

IN VITRO METHODS AND TESTS

Functional Analysis of Interactions Between 53BP1, BRCA1 and p53 – [105](#)

IN VIVO METHODS AND TESTS

In Vivo Transcriptional Activation of Estrogen Receptor Target Genes: Differential Regulation in Mammary Gland Uterus and Bone – [118](#)

The Role of a FGF-Binding Protein in Breast Cancer – [124](#)

INCLUSIONS

The First Rock in the Solar System – [227](#)

INCOMPRESSIBLE FLOW

Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – [66](#)

INDIA

Precipitation Chemistry Studies in India: A Search for Regional Patterns – [100](#)

INDUCTION HEATING

Periodica Polytechnica Electrical Engineering, Volume 46, No. 1-2, 2002 – [57](#)

INDUSTRIAL PLANTS

The Potential for solar Heat for Industrial Processes: A Preliminary Study of Swedish Possibilities – [80](#)

INDUSTRIAL SAFETY

Oxygen: Not Just for Breathing Anymore – [242](#)

INDUSTRIES

Mineral Commodity Summaries, 2001 – [25](#)

INFECTIOUS DISEASES

Identification of Secondary Mutations Which Enhance and Stabilize the Attenuation of Brucella HTRA Mutants: Improving Brucella HTRS-Based Strains as Vaccine – [106](#)

Improving Retroviral Vectors for Gene Therapy of Prostate Cancer – [133](#)

Satellites as Sentinels for Climate and Health – [70](#)

INFERENCE

Essential Autonomous Science Inference on Rovers (EASIR) – [235](#)

INFORMATION DISSEMINATION

Post-Conflict Reconstruction. A Selected Bibliography – [205](#)

INFORMATION FLOW

Automated Data Processing as an AI Planning Problem – [69](#)

INFORMATION MANAGEMENT

Architectural Design for the Global Legal Information Network – [203](#)

Center of Excellence in Space Data and Information Sciences – [207](#)

Systems-Level Energy Audit for Main Complex, Construction Engineering Research Laboratory – [81](#)

INFORMATION RETRIEVAL

A Step Beyond Simple Keyword Searches: Services Enabled by a Full Content Digital Journal Archive – [206](#)

ASC3: Algorithmic Strategies for Compiler Controlled Caches – [151](#)

Development and Operations of the Astrophysics Data System – [219](#)

Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions – [203](#)

Science and Technology Text Mining: Hypersonic and Supersonic Flow – [203](#)

INFORMATION SYSTEMS

A Scalability Model for ECS's Data Server – 144

An On-line Technology Information System (OTIS) for Advanced Life Support – 207

Annual Report 2002 on FOI's Research on Command, Control, Communication and Information Technology (C31) – 51

Pre-Game-Theory Based Information Technology (GAMBIT) Study – 165

Spatial Information Technology Center at Fulton-Montgomery Community College – 201

INFRARED ASTRONOMY SATELLITE

Space Instruments: General Considerations – 20

INFRARED DETECTORS

Application of Radiative Transfer Techniques to Background Clutter Mitigation – 150

Parameter Comparison for Low-Noise MoAu TES Bolometers – 74

INFRARED INSTRUMENTS

SOFIA First Generation Science Instruments – 68

INFRARED RADIATION

High Power Mid-IR Semiconductor Lasers for LADAR – 71

What is the Electromagnetic Spectrum? What is Infrared? How was the Infrared Discovered? – 242

INFRARED SIGNATURES

Improved Infrared Object Signature Calculations for SensorVision (Trade Mark) by the Use of RadTherm (Trade Mark) – 188

INFRARED TELESCOPES

Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – 70

INFRASONIC FREQUENCIES

A Plan of Development for Detection Systems for Seismic and Infrasound Arrays – 87

INJECTORS

Emission Measurements from a Laser Driven Electron Injector – 187

Isothermal Microcalorimetric Evaluation of Compatibility of Proposed Injector Materials with High-Test Hydrogen Peroxide Propellant – 46

INJURIES

Are Gulf War Veterans Experiencing Illness Due to Exposure to Smoke from Kuwaiti Oil Well Fires? Examination of Department of Defense Hospitalization Data – 131

INORGANIC COMPOUNDS

Investigating the Partitioning of Inorganic Elements Consumed by Humans between the Various Fractions of Human Wastes: An Alternative Approach – 33

INORGANIC MATERIALS

A Comparison of Biotic and Inorganic Sulfide Films – 34

INPUT/OUTPUT ROUTINES

Contract Representation for Run-Time Monitoring and Enforcement – 138

EOSDIS Project on High-Performance I/O Techniques – 146

High-Performance Input/Output Systems for Parallel Computers – 142

Understanding and Improving High-Performance I/O Subsystems – 145

INSPECTION

Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation – 159

Navigation and Vessel Inspection Circular No. 8-01, Change 1. CH-1 to NVIC 8-01, Approval of Navigation Equipment for Ships – 201

INSTRUMENTS

Maximum Acceptance Detector for the Fermilab Collider (MAX) – 200

Space Instruments: General Considerations – 20

INSULATION

Electrostatic Probe with Shielded Probe Insulator Tube for Low Disturbing Plasma Measurements in Hall Thrusters – 195

INTEGRATED CIRCUITS

ManTech Journal. Guidelines for Defense Contractors. Volume 8/Number 2 – 9

INTERFACIAL TENSION

Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42

INTERFEROMETERS

High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures – 65

INTERFEROMETRY

Phase-Synchronized Modal Testing of Mirror Membrane – 188

INTERNETS

Digital Economy, 2003 – 204

Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 155

Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 155

INTEROPERABILITY

Army Model and Simulation Master Plan – 146

INTERPLANETARY FLIGHT

Combining Electric and Sail Propulsion for Interplanetary Sample Return – 60

INTERPLANETARY MAGNETIC FIELDS

Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field – 93

Solar and Solar Wind: Interplanetary Magnetic Flux Ropes – 89

Solar Wind and Interplanetary Disturbances – 240

INTERPLANETARY SPACE

Solar and Solar Wind: High Energy Particle Acceleration in the Heliosphere – 239

INTERSTELLAR MATTER

An Empirical Decomposition of Near-IR Emission into Galactic and Extragalactic Components – 216

X-ray Haloes and Scattering by Interstellar Grains – 236

INTERTROPICAL CONVERGENT ZONES

Factors Affecting the Latitudinal Location of the Intertropical Convergence Zone in a GCM – 91

INVERTERS

Dual Mode Inverter Control Test Verification – 57

ION BEAMS

Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – 39

ION CYCLOTRON RADIATION

Interaction of Neutral Beam Injected Fast Ions with Ion Cyclotron Resonance Frequency Waves – 180

ION DISTRIBUTION

What are the Causes of the Formation of the Sub-Alfvenic Flows at the High Latitude Magnetopause – 18

ION IMPACT

Scaling of Cross Sections for Ion-Atom Impact Ionization – 35

ION PROPULSION

SEP Mission to Titan NEXT Aerocapture In-Space Propulsion (Quicktime Movie) – 24

ION STRIPPING

Comparison of Quantum Mechanical and Classical Trajectory Calculations of Cross Sections for Ion-Atom Impact Ionization of Negative- and Positive-Ions for Heavy Ion Fusion Applications – 193

IONIZATION CROSS SECTIONS

Scaling of Cross Sections for Ion-Atom Impact Ionization – 35

IONIZATION POTENTIALS

Comparison of Quantum Mechanical and Classical Trajectory Calculations of Cross Sections for Ion-Atom Impact Ionization of Negative- and Positive-Ions for Heavy Ion Fusion Applications – 193

IONIZATION

Dissociative Ionization and Product Distributions of Benzene and Pyridine by Electron Impact – 38

IONIZING RADIATION

Dynamic Tissue Culture from Prostate Biopsy Specimens as a model for Predicting Tumor Radiosensitivity to Ionizing Radiation Treatment – 126

IONOSPHERES

Stormtime Particle Energization with AMIE Potentials – 88

IONOSPHERIC CURRENTS

Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field – 93

Geomagnetic Storms – 240

IONOSPHERIC DISTURBANCES

Ionosphere and Thermosphere: Ionospheric Irregularities – 89

Ionospheric Irregularities – 93

IONOSPHERICS

Validation of the Paramaterized Real-Time Ionospheric Specification Model (PRISM) – 87

IONS

End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – 80

Washing Bridges to Reduce Chloride – 31

IO

Big Mountain, Big Landslide on Jupiter's Moon, Io – 232

Jupiter's Hot, Mushy Moon – 234

IRON

Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – 39

IRRADIANCE

SORCE and Future Satellite Observations of Solar Irradiance – 239

IRRADIATION

Heavy Section Steel Irradiation Program Monthly Letter Status Report for March 2001 – 41

ISOMERS

X-Ray Sources for the Triggering of Electromagnetic Pulses from Isomeric Materials – 185

ISOTHERMAL PROCESSES

Isothermal Microcalorimetric Evaluation of Compatibility of Proposed Injector Materials with High-Test Hydrogen Peroxide Propellant – 46

ISOTOPES

Baby Stars in Orion Solve Solar System Mystery – 214

ISOTOPIC LABELING

Genesis Discovery Mission: Science Canister Processing at JSC – 237

ITERATION

Bistable Reflective Etalon (BRET) – 56

ITERATIVE SOLUTION

Analytic Solution to the Problem of Aircraft Electric Field Mill Calibration – 162

JAMAICA

Prostate Cancer in Nigerians, Jamaicans and U.S. Blacks – 205

JAMES WEBB SPACE TELESCOPE

Town Hall Meeting Presentation – 216

JAMMING

YMER User Guide – 51

JAPAN

Monthly Report of the Meteorological Satellite Center: August 2003 – 94

Monthly Report of the Meteorological Satellite Center: July 2003 – 94

JAVA (PROGRAMMING LANGUAGE)

Applying Jlint to Space Exploration Software – 153

JET AIRCRAFT NOISE

Optimum Climb to Cruise Noise Trajectories for the High Speed Civil Transport – 9

JOINING

The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59

JUPITER (PLANET)

Bands on Europa – 231

Big Mountain, Big Landslide on Jupiter's Moon, Io – 232

Europa's Salty Surface – 226

KALMAN FILTERS

A Sounding Rocket Attitude Determination Algorithm Suitable for Implementation Using Low Cost Sensors – 161

Efficient Region Tracking and Target Position Estimation in Image Sequences using Kalman Filters – 69

KEPLER LAWS

Kepler's Laws of Planetary Motion – 221

KINETIC EQUATIONS

Self-Consistent System of Equations for a Kinetic Description of the Low-Pressure Discharges Accounting for the Nonlocal and Collisionless Electron Dynamics – 193

KINETICS

Improved Conservation Properties for Particle-in-cell Simulations with Kinetic Electrons – 194

KNOWLEDGE BASED SYSTEMS

Verification and Validation of Embedded Knowledge-Based Software Systems – 205

KOREA

Translation of the Observations of Meteorors Recorded in the Koryo-sa – 234

KRYPTON

50 KW Class Krypton Hall Thruster Performance – 21

KUIPER BELT

Spectral Models of Kuiper Belt Objects and Centaurs – 216

The Kuiper Belt and Oort Cloud – 228

LABORATORIES

Electromagnetics Laboratory Annual Report 2002 – 172

LAKES

Life on Mars? – 230

LAMINATES

Aspects of the Mechanical Behavior of Stitched T300 Mat/Urethane 420 IMR Composite – 30

LANDFILLS

How to Prepare a Startup, Shutdown, Malfunction Plan for Collection and Control Systems at Municipal Solid Waste Landfills – 82

LANTHANUM COMPOUNDS

Thermal Conductivity and Stability of HfO₂-Y₂O₃ and La₂Zr₂O₇ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – 25

LASER ALTIMETERS

Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – 88

Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – 20

ICESat's Laser Measurements of Polar Ice, Atmosphere, Ocean, and Land – 103

Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – 88

LASER BEAMS

Localized Flow Control in High Speed Flows Using Laser Energy Deposition – 5

LASER PUMPING

Emission Measurements from a Laser Driven Electron Injector – 187

LASERS

Calculation and Optimization of Laser Acceleration in Vacuum – 175

Design and Simulation of Transmission Properties of Hollow Bragg Fibers Fabricated from Omnidirectionally Reflective Composite Dielectric Materials – 58

Preliminary Observations Regarding LDV Scans of Panels Excited by Broadband Actuators at the US Capitol – 72

LEAD (METAL)

Great Lakes Binational Toxics Strategy U.S. Challenge on Alkyl-lead: Report on Use of Alkyl-lead in Automotive Gasoline – 82

LEADING EDGES

An Experimental Investigation of Leading Edge Vortices and Passage to Stall of Nonslender Delta Wings – 4

Motion Effects on Leading-Edge Vortex Behavior over Delta Wings and Generalized Modeling – 7

LEAKAGE

Engine Blowdown Device – 73

LEARNING

An Analysis of Implementation Issues for the Searchable Content Object Reference Model (SCORM) in Navy Education and Training – 204

LEGAL LIABILITY

Architectural Design for the Global Legal Information Network – 203

LEPTONS

Measurement of the Michel Parameters in Leptonic Decays of the Tau – 179

Measurement of the Tau Lepton Lifetime – 171

Search for Bs Mixing with Inclusive Lepton Events at SLD – 167

LIAPUNOV FUNCTIONS

Multiobject Robust Control of Nonlinear Systems via State Dependent Coefficient Representations and Applications – 162

LIFE CYCLE COSTS

Equivalent Mass versus Life Cycle Cost for Life Support Technology Selection – 136

U.S. LCI Database Project-Phase I Final Report – 203

LIFE (DURABILITY)

C/SiC Life Prediction for Propulsion Applications – 31

Space Instruments: General Considerations – 20

U.S. LCI Database Project-Phase I Final Report – 203

LIFE SUPPORT SYSTEMS

An On-line Technology Information System (OTIS) for Advanced Life Support – 207

Design Rules for Life Support Systems – 137

Equivalent Mass versus Life Cycle Cost for Life Support Technology Selection – 136

LIGHT AMPLIFIERS

Recent Progress in Optical Switching Device Technologies in NTT – 49

LIGHT EMITTING DIODES

Polymer Light-Emitting Diode (PLED) Process Development – 57

LIGHT MODULATORS

Optimization of a Spatial Light Modulator for Beam Steering and Tracking Applications – 173

LIGHT (VISIBLE RADIATION)

What is the Electromagnetic Spectrum? What is Infrared? How was the Infrared Discovered? – 242

LIGHTNING

Objective Classification of Radar Profile Types, and Their Relationship to Lightning Occurrence – 52

Voltage Gradient Along a Lightning Channel During Strikes to Aircraft – 1

LIMITER CIRCUITS

Protections Against HPM Front-Door Coupling: A Survey of Commercial Limiters – 53

LINEAR ACCELERATORS

BABAR: A Community Web Site in an Organizational Setting – 167

Beam Collimation at Hadron Colliders – 199

Frequency Chirped SASE FEL – 178

LEGO: A Modular Approach to Accelerator Alignment Data Analysis – 179

SLAC Polarized Electron Source and Beam for E-158 – 199

LINEAR SYSTEMS

EAGLE can do Efficient LTL Monitoring – 158

Rule-Based Runtime Verification – 158

LIQUID HYDROGEN

High Power Liquid Hydrogen Target for Parity Violation Experiments – 171

LIQUID METALS

Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – 42

LIQUID PROPELLANT ROCKET ENGINES

Investigation of Impinging Stream Vortex Chamber Concepts for Liquid Rocket Engine Applications – 23

LIQUID ROCKET PROPELLANTS

Isothermal Microcalorimetric Evaluation of Compatibility of Proposed Injector Materials with High-Test Hydrogen Peroxide Propellant – 46

LITHOGRAPHY

Sub-1nm Patterning Accuracy via Spatial-Phase Locking – 60

LOADS (FORCES)

Effects of Blade Sweep on V-22 Whirl Flutter and Loads – 10

Investigation of the IEC Safety Standard for Small Wind Turbine Design through Modeling and Testing – 2

LOCAL AREA NETWORKS

Internet Performance and Reliability Measurements – 142

LOGIC

Logic Synthesis Avoiding State Space Explosion – 139

LOOPS

Asymptotic Pade Approximant Predictions: up to Five Loops in QCD and SQCD – 174

LOW CURRENTS

A 10 Kelvin Magnet for Space-Flight ADRs – 210

LOW NOISE

Parameter Comparison for Low-Noise MoAu TES Bolometers – 74

Ultra High Bypass Ratio Low Noise Engine Study – 12

LOW VOLTAGE

Investigation of Low-Voltage/High-Thrust Hall Thruster Operation – 21

LUMINOSITY

DIRC for a Higher Luminosity B Factory – 198

Gamma-Ray Bursts and Cosmology – 224

Muon Collider Design – 174

Verge of One Petabyte: The Story Behind the BaBar Database – 167

LUNAR CRATERS

Impact Craters in the Solar System – 233

LUNAR GEOLOGY

Space Science Reference Guide, 2nd Edition – 225

The Moon Beyond 2002 – 227

LUNAR PHASES

Phases of the Moon – 226

LUNAR SURFACE

Ice on the Bone Dry Moon – 234

LYMPHOCYTES

Induction of Cytotoxic T Lymphocytes for Immunotherapy of Breast Cancer – 122

MAGNETIC CONTROL

Magnetic Control of Solutal Buoyancy-driven Convection – 63

MAGNETIC COOLING

Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – 70

Passive Superconducting Shielding: Experimental Results and Computer Models – 197

MAGNETIC DISTURBANCES

Magnetosphere: Geomagnetic Storms – 90

Magnetosphere: Transmission Line Model for the Ground Magnetic Disturbances – 90

Transmission Line Model for Ground Magnetic Disturbances – 92

MAGNETIC FIELD CONFIGURATIONS

End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – 80

Solar and Solar Wind: Energy Build-up Study of Solar Flares – 239

MAGNETIC FIELD RECONNECTION

Eruption of a Multiple-Turn Helical Magnetic Flux Tube in a Large Flare: Evidence for External and Internal Reconnection that Fits the Breakout Model of Solar Magnetic Eruptions – 238

Flux Rope Acceleration and Enhanced Magnetic Reconnection Rate – 220

MAGNETIC FIELDS

Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – 162

Magnetic Control of Solutal Buoyancy-driven Convection – 181

Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – 189

New Data, New Ideas, and Lively Debate about Mercury – 212

What is the Electromagnetic Spectrum? What is Infrared? How was the Infrared Discovered? – 242

MAGNETIC FILMS

Growth Induced Magnetic Anisotropy in Crystalline and Amorphous Thin Films – 38

High Anisotropy CoPtCrB Magnetic Recording Media – 172

MAGNETIC FLUX

Eruption of a Multiple-Turn Helical Magnetic Flux Tube in a Large Flare: Evidence for External and Internal Reconnection that Fits the Breakout Model of Solar Magnetic Eruptions – 238

MAGNETIC NOZZLES

Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – 189

MAGNETIC PERMEABILITY

A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74

MAGNETIC PROPERTIES

Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – 39

X-Ray Studies of Magnetic Nanoparticle Assemblies – 172

MAGNETIC SHIELDING

Passive Superconducting Shielding: Experimental Results and Computer Models – 197

MAGNETIC STORAGE

Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – 39

X-Ray Absorption and Diffraction Studies of Magnetic Nanoparticle Assemblies – 26

MAGNETIC STORMS

Geomagnetic Storms – 240

Interplanetary Magnetic Flux Ropes – 241

Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards – 239

Magnetosphere: Geomagnetic Storms – 90

Space Weather and its Hazards on the High-Tech System – 240

Stormtime Particle Energization with AMIE Potentials – 88

MAGNETOHYDRODYNAMIC FLOW

Formation of the Magnetosphere and Magnetospheric Plasma Regime – 241

Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster – 189

Resistive Wall Modes and Plasma Rotation in DIII-D – 192

MAGNETOHYDRODYNAMIC STABILITY

Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – 195

Discharge Improvement through Control of Neoclassical Tearing Modes by Localized ECCD in DIII-D – 192

Quantitative Tests of ELMs as Intermediate n Peeling-Ballooning Modes – 192

MAGNETOHYDRODYNAMICS

Ece Radiometer Upgrade on the DIII-D Tokamak – 194

Generation of Convection in the Magnetosphere-Ionosphere Coupling System – 93

MAGNETOMETERS

Nondestructive Evaluation of a Metal Matrix Composite – 30

Observations and Calibrations of DMSP F15 SSM Data December 1999 - October 2000 – 48

MAGNETOPAUSE

What are the Causes of the Formation of the Sub-Alfvenic Flows at the High Latitude Magnetopause – 18

MAGNETOPLASMA DYNAMICS

Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17

MAGNETOSHEATH

End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – 80

MAGNETOSPHERE-IONOSPHERE COUPLING

Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field – 93

Generation of Convection in the Magnetosphere-Ionosphere Coupling System – 93

Magnetosphere: Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field – 90

Magnetosphere: Generation of Convection in the Magnetosphere-ionosphere Coupling System – 90

Review of the Communications Research Laboratory – 88

MAGNETOSPHERIC INSTABILITY

Geomagnetic Storms – 240

MAGNETOSTATICS

Electrostatic Image Theory for the Anisotropic Boundary – 172

MAGNETRON SPUTTERING

A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74

MAINTENANCE

Canister Transfer System Event Sequence Calculation – 202

MAMMARY GLANDS

A Molecular Model for Repression of BRCA-1 Transcription by the Aryl Hydrocarbon Receptor – 105

A Training Program in Breast Cancer Research Using NMR Techniques – 113

Administration of Additional Phosphorylated Prolactin During Pregnancy Inhibits Mammary Ductal Branching and Promotes Premature Lobuloalveolus Development – 113

Association Between Offspring's hCG Genotype and Breast Cancer Risk in Mothers: A Novel Approach – 112

Breast Cancer Training Program – 130

Cell Cycle Dependent Regulation of Human Progesterone in Breast Cancer – 114

Center for Behavioral Research: Individual Interventions for Breast Cancer Patients – 124

Combining Electron With Intensity Modulated Photon Beams for Breast Cancer – 123

Cooperative Interactions During Human Mammary Epithelial Cell Immortalization – 134

Determining Effects of Genes, Environment, and Gene X Environment Interaction That Are Common to Breast and Ovarian Cancers Via Bivariate Logistic Regression – 125

Development of an erbB Antagonist – 124

Direct Effects of Folate Metabolism on Gene Expression in Metastatic Breast Cancer – 133

Drug Discovery for Breast Cancer by Mirror-Image Display – 105

Effect of a Single Nucleotide Polymorphism (NP) on Breast Cancer Invasion – 126

Genetic Influences on Toxicity and Prognosis in Women Treated With Breast-Conserving Surgery and Radiation Therapy – 118

Genetic Requirements for the Transformation of Human Cells – 117

Genetically Engineered Autologous Cells for Antiangiogenic Therapy of Breast Cancer – 119

Identifying and Reaching Populations at Risk: The Paradox of Breast Cancer Control – 113

Impact of Breast Cancer Treatments on Gonadal Function and Reproduction Health – 125

In Vivo Transcriptional Activation of Estrogen Receptor Target Genes: Differential Regulation in Mammary Gland Uterus and Bone – 118

Induction of Cytotoxic T Lymphocytes for Immunotherapy of Breast Cancer – 122

Leptin (Obesity Protein) and Breast Cancer Metastasis – 129

Mechanism by which p66 Shc Suppresses Breast Cancer Tumorigenicity – 129

Mechanism of Mutation in Non-Dividing Cells – 127

Molecular Mechanisms of Metastatic Progression in Breast Cancer – 111

Recombinational Repair Genes and Breast Cancer Risk – 112

Research Training in Biopsychosocial Breast Cancer Research – 122

Role of E-Cadherin Homophilic Contacts in the Inhibition of Cell Growth of Primary Breast Cells – 129

Role of Nuclear Receptor Coactivators, AIB-1 and SRC-1, in the Development of Breast Cancer – 114

The Role of a FGF-Binding Protein in Breast Cancer – 124

The Role of AKT1 in Mammary Tumorigenesis and Transformation – 128

The Role of Fps in Tumor-Associated Angiogenesis – 118

The Role of GADD34 (Growth Arrest and DNA Damage- Inducible Protein) in Regulating Apoptosis, Proliferation, and Protein Synthesis in Human Breast Cancer Cells – 115

The Role of N-CoR During Normal Mammary Gland Development – 109

The Role of Neuropilin in Breast Cancer Metastasis – 119

The Roles of FGF-2 TGF Beta and TGF Beta Receptor 2 in Breast Cancer Dormancy – 128

Training Grant in Epidemiology and Prevention of Breast Cancer – 114

Understanding Racial Disparities in Mammography Use Among Breast Cancer Survivors – 135

MANAGEMENT PLANNING

Management Planning Guide for Information Systems Security Auditing – 141

MANAGEMENT SYSTEMS

An Analysis of Implementation Issues for the Searchable Content Object Reference Model (SCORM) in Navy Education and Training – 204

MANAGEMENT

Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127

MANNED MARS MISSIONS

The Ph-D Project: Manned Expedition to the Moons of Mars – 233

MANUFACTURING

Bromine Safety – 81

National Emission Standards for Hazardous Air Pollutants Surface Coating of Metal Cans. Background Information for Final Standards. Summary of Public Comments and Responses – 83

Polymer Light-Emitting Diode (PLED) Process Development – 57

SLAC Design and Manufacturing Process of Sphere-Mounted Reflectors – 187

MAPPING

Mapping Charting and Geodesy Branch. Abstracts of Publications 2000-2002 – 78

MARINE BIOLOGY

Ship Shock Trial Modeling and Simulation of USS WINSTON S. CHURCHILL (DDG 81) – 149

MARINE MAMMALS

Marine Mammal Health: Development of Immunodiagnostic and Viral Diagnostic Methodologies and Reagents – 123

MARKING

Tagging Water Sources in Atmospheric Models – 102

MARKOV PROCESSES

Hybrid Discrete-Continuous Markov Decision Processes – 141

MARS CRATERS

For a Cup of Water on Mars: Gusev Crater – 230

MARS EXPLORATION

Dirty Ice on Mars – 229

NASA's MERBoard: An Interactive Collaborative Workspace Platform – 235

MARS (PLANET)

Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 148

Organic Compounds in Martian Meteorites May be Terrestrial Contaminants – 228

MARS ROVING VEHICLES

Essential Autonomous Science Inference on Rovers (EASIR) – 235

Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147

NASA's MERBoard: An Interactive Collaborative Workspace Platform – 235

Terrain Model Registration for Single Cycle Instrument Placement – 235

MARS SURFACE

Dirty Ice on Mars – 229

For a Cup of Water on Mars: Gusev Crater – 230

Life on Mars? – 230

Meteorites from Mars, Rocks from Canada – 231

NASA's MERBoard: An Interactive Collaborative Workspace Platform – 235

Space Science Reference Guide, 2nd Edition – 225

Terrain Model Registration for Single Cycle Instrument Placement – 235

The Martian Interior – 230

MASS SPECTROSCOPY

Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – 36

Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37

MASSIVELY PARALLEL PROCESSORS

Understanding and Improving High-Performance I/O Subsystems – 145

MATERIALS SCIENCE

Annual Report 2002 on Material Science and Technology – 27

MATHEMATICAL LOGIC

Proceedings STRATA 2003. First International Workshop on Design and Application of Strategies/Tactics in Higher Order Logics; Focus on PVS experiences – 165

MATHEMATICAL MODELS

A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – 156

A New Modular Approach for Tightly Coupled Fluid/Structure Analysis – 63

Application of the Models-3 Community Multi-Scale Air Quality (CMAQ) Model System to SOS/Nashville 1999 – 84

Closed Form Solutions of Maxwell's Equations in the Computer Age – 140

Dynamic Tissue Culture from Prostate Biopsy Specimens as a model for Predicting Tumor Radiosensitivity to Ionizing Radiation Treatment – 126

Electrostatic Image Theory for the Anisotropic Boundary – 172

Execution-Based Model Checking of Interrupt-Based Systems – 157

Hybrid Discrete-Continuous Markov Decision Processes – 141

Leveraging Improvements in Precipitation Measuring from GPM Mission to Achieve Prediction Improvements in Climate, Weather and Hydrometeorology – 99

Motion Effects on Leading-Edge Vortex Behavior over Delta Wings and Generalized Modeling – 7

Performance Characteristics of the Multi-Zone NAS Parallel Benchmarks – 152

Performance Modeling of Network-Attached Storage Device Based Hierarchical Mass Storage Systems – 145

Scalability Analysis and Use of Compression at the Goddard DAAC and End-to-End MODIS Transfers – 144

Scoping Planning Agents With Shared Models – 160

Ship Shock Trial Modeling and Simulation of USS WINSTON S. CHURCHILL (DDG 81) – 149

Spectral Models of Kuiper Belt Objects and Centaurs – 216

Unsteady Aerodynamic Model for Thin Wings With Evolutive Vortex Sheets – 4

MAXWELL-BOLTZMANN DENSITY FUNCTION

Numerical Loading of a Maxwellian Probability Distribution Function – 176

MEASURING INSTRUMENTS

Journal of Research of the National Institute of Standards and Technology, May-June 2003. Volume 108, No. 3 – 243

Search for Rare Charm Meson Decays at FNAL E791 – 169

MECHANICAL PROPERTIES

Aspects of the Mechanical Behavior of Stitched T300 Mat/Urethane 420 IMR Composite – 30

C/SiC Life Prediction for Propulsion Applications – 31

Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – 45

Production of Nanocomposites – 29

Structural Evaluation of Exo-Skeletal Engine Fan Blades – 75

Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles – 75

Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – 206

MEDICAL PERSONNEL

An Assessment of the Potential for Increasing the Salvageability of Critical Combat Traumas Through First Responder Interventions – 132

MEDICAL SCIENCE

A Training Program in Breast Cancer Research Using NMR Techniques – 113

Center for Behavioral Research: Individual Interventions for Breast Cancer Patients – 124

Hangtian Yixue Yu Yixue Gongscheng) Volume 16, Number 5, October 2003 – 16

Journal of Research of the National Institute of Standards and Technology, May-June 2003. Volume 108, No. 3 – 243

Research Training in Biopsychosocial Breast Cancer Research – 122

MELTING POINTS

Measuring Temperature Reading – 94

MEMBRANES

Phase-Synchronized Modal Testing of Mirror Membrane – 188

MEMORY (COMPUTERS)

Data Intensive Systems (DIS) Benchmark Performance Summary – 156

MENTAL PERFORMANCE

Cognitive Measures of Vietnam-Era Prisoners of War – 131

Dynamic Measurement of the Operator for Future System Development – 11

Mental Representation of Auditory Sources – 184

Predictors of Navy Attrition. II. A Demonstration of Potential Usefulness for Screening – 111

MERCURY (METAL)

Screening Test Results of Fatigue Properties of Type 316LN Stainless Steel in Mercury – 41

MERCURY (PLANET)

Mercury Unveiled – 212

New Data, New Ideas, and Lively Debate about Mercury – 212

MESONS

Application Framework and Data Model Prototype for the BaBar Experiment – 198

B System as a Window to New Physics – 183

DIRC for a Higher Luminosity B Factory – 198

First Observation of inclusive Beta to the Charmed Strange Baryons $\chi_i(\text{sup O})(\text{sub C})$ and $\chi_i(\text{sup +})(\text{sub C})$ – 176

Investigation of Semileptonic B Meson Decay to P-Wave Charm Mesons – 180

Measurements of the Meson-Photon Transition Form Factors of Light Pseudoscalar Mesons at Large Momentum Transfer – 174

Observation of Exclusive Two-body B Decays to Kaons and Pions – 183

Search for $B \rightarrow \mu$ Anti-Muon-Neutrino Gamma and $B \rightarrow e$ Anti-Electron-Neutrino Gamma – 180

Search for Color-Suppressed B Hadronic Decay Processes with CLEO – 180

Search for Neutrinoless τ Decays Involving π^0 or η Mesons – 196

Search for Rare Charm Meson Decays at FNAL E791 – 169

Study of Inclusive Semileptonic B Meson Decays with the BABAR Detector – 200

METABOLISM

Portable Physical Activity Monitors for Measuring Energy Metabolism in ROTC Cadets – 121

METABOLITES

Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – 36

Development of an erbB Antagonist – 124

Simultaneous Determination of Cocaine, Cocaine, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37

Studies on the Novel Anticancer Agents Metabolically Formed from 17-Beta-Estradiol – 123

METAL COATINGS

Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30

METAL MATRIX COMPOSITES

Nondestructive Evaluation of a Metal Matrix Composite – 30

METAL-METAL BONDING

ManTech Journal. Meeting the Challenge. Volume 10, Number 2, 1985 – 31

METAMORPHISM (GEOLOGY)

High Power Mid-IR Semiconductor Lasers for LADAR – 71

METASTASIS

Collagenases in Breast Cancer Cell-Induced Metastatic Tumor Growth and Progression – 116

Direct Effects of Folate Metabolism on Gene Expression in Metastatic Breast Cancer – 133

Effect of a Single Nucleotide Polymorphism (NP) on Breast Cancer Invasion – 126

Fibrinolysis in Tumor Associated Angiogenesis – 108

Growth Inhibitory and Stimulatory Signals in Prostate Cancer – 121

Leptin (Obesity Protein) and Breast Cancer Metastasis – 129

Mechanisms for Controlling Breast Cancer Growth and Skeletal Metastasis – 116

- Metastasis Genes in Breast Cancer Metastasis to Bone – 117
- Molecular Characterization of Squamous Cell Carcinomas Derived From Recessive Dystrophic Epidermolysis Bullosa – 134
- Molecular Mechanisms of Metastatic Progression in Breast Cancer – 111
- Study of RANKL Expression in Metastatic Breast Carcinoma – 116
- The Role of Neuropilin in Breast Cancer Metastasis – 119
- METEORITE COLLISIONS**
- Damage by Impact: The Case at Meteor Crater, Arizona – 209
- METEORITE CRATERS**
- Damage by Impact: The Case at Meteor Crater, Arizona – 209
- METEORITES**
- Meteorites from Mars, Rocks from Canada – 231
- Organic Compounds in Martian Meteorites May be Terrestrial Contaminants – 228
- Searching Antarctic Ice for Meteorites – 228
- METEORITIC COMPOSITION**
- Baby Stars in Orion Solve Solar System Mystery – 214
- The First Rock in the Solar System – 227
- METEOROIDS**
- Simulation of Prebiotic Processing by Comet and Meteoroid Impact: Implications for Life on Early Earth and Other Planets – 236
- Translation of the Observations of Meteors Recorded in the Koryo-sa – 234
- METEOROLOGICAL PARAMETERS**
- ICESat: Ice, Cloud, and Land Elevation Satellite – 94
- Monthly Report of the Meteorological Satellite Center: August 2003 – 94
- Monthly Report of the Meteorological Satellite Center: July 2003 – 94
- METEOROLOGICAL RADAR**
- A Downscaling Analysis of the Urban Influence on Rainfall: TRMM Satellite Component AMS Conference on Satellite Meteorology and Oceanography – 98
- Leveraging Improvements in Precipitation Measuring from GPM Mission to Achieve Prediction Improvements in Climate, Weather and Hydrometeorology – 99
- METEOROLOGICAL SATELLITES**
- NASA's Scientific Agenda for GPM Mission – 96
- METROLOGY**
- Helsinki University of High Voltage Institute Annual Report 2002 – 56
- MICROBIOLOGY**
- A Comparison of Biotic and Inorganic Sulfide Films – 34
- MICROCHANNELS**
- Field-effect Flow Control in Polymer Microchannel Networks – 61
- MICROELECTROMECHANICAL SYSTEMS**
- Development of a Large-scale 3D MEMS Optical Switch Module – 187
- Field-effect Flow Control in Polymer Microchannel Networks – 61
- Recent Progress in Optical Switching Device Technologies in NTT – 49
- MICROFLUIDIC DEVICES**
- Field-effect Flow Control in Polymer Microchannel Networks – 61
- MICROORGANISMS**
- Antimicrobial Surface Treatments of Aluminium in Air Conditioning Systems – 43
- MICROPROCESSORS**
- ASC3: Algorithmic Strategies for Compiler Controlled Caches – 151
- MICROSTRUCTURE**
- Isolation of Microstructure in Proton-Irradiated Steels – 40
- MICROWAVE ANISOTROPY PROBE**
- Mapping the Baby Universe – 228
- MICROWAVE EQUIPMENT**
- LLAMA (Lincoln Laboratory Advanced MARTHA Applications) Software Manual – 154
- MICROWAVE RADIOMETERS**
- Use of Collocated KWAJEX Satellite, Aircraft, and Ground Measurements for Understanding Ambiguities in TRMM Radiometer Rain Profile Algorithm – 96
- MILITARY AIRCRAFT**
- CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft – 3
- MILITARY TECHNOLOGY**
- Army Model and Simulation Master Plan – 146
- Technical Evaluation Report, Part A - Vortex Flow and High Angle of Attack – 5
- MILKY WAY GALAXY**
- The Center of the Galaxy – 214
- MINERALS**
- Dirty Ice on Mars – 229
- Mineral Commodity Summaries, 2001 – 25
- MINIATURIZATION**
- A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188
- Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation – 159
- MIRRORS**
- Chiral Rings, Mirror Symmetry and the Fate of Localized Tachyons – 169
- Phase-Synchronized Modal Testing of Mirror Membrane – 188
- MISSILE DEFENSE**
- Single Integrated Air Picture (SIAP) Attributes – 150
- MISSILES**
- FOI/FFA 2002 Research on Missiles, Stealth Technology and UAVs, Complementary FMV 250180-LB604516 – 66
- MISSION PLANNING**
- Large-Scale Multi-Agent Distributed Mission Planning and Execution in Complex Dynamic Environments – 52
- MITOSIS**
- MCAK and Stathmin Upregulation in Breast Cancer Cells: Etiology and Response to Pharmacologic Reagents – 108
- MIXED OXIDES**
- Neutronic Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997. Volume 4, Part 6-Esada Plutonium Program Critical Experiments: Power Distribution Measurements – 28
- MOBILE COMMUNICATION SYSTEMS**
- High Coverage Multicasting for Mobile Ad-hoc Networks – 51
- Telecommunication Networks for Mobile & Distributed Communications/ Computing – 52
- MODELS**
- A Scalability Model for ECS's Data Server – 144
- Geometrization of Matter Proposal in the Barrett-Crane Model and Resolution of Cosmological Problems – 217
- Model Checking Correctness Properties of Electronic Contracts – 139
- Model Independent Analysis of Beam Dynamics in Accelerators – 169
- Validation of the Parameterized Real-Time Ionospheric Specification Model (PRISM) – 87
- MODIS (RADIOMETRY)**
- Remote Sensing of Aerosol using MODIS, MODIS+CALIPSO and with the AEROSAT Concept – 97
- MODULATION**
- Experimental Measurement of Resonance Islands Induced by the RF Voltage Modulation – 175
- MODULATORS**
- Field-effect Flow Control in Polymer Microchannel Networks – 61
- MOISTURE CONTENT**
- Example Moisture Mass Balance Calculations for Bioreactor Landfills – 83
- MOISTURE**
- Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – 100

MOLECULAR BEAM EPITAXY

Ohio State University Cooperative Research and Development Agreement (CRDA) . Crystal Growth by Molecular Beam Epitaxy (MBE) and Characterization of Optoelectronic Devices – [72](#)

MOLECULAR BIOLOGY

Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – [32](#)

MOLECULAR CLOUDS

Electrical Charging of the Clouds of Titan – [211](#)

MOLECULAR INTERACTIONS

Photon-Counting Single-Molecule Spectroscopy for Studying Conformational Dynamics and Macromolecular Interactions – [32](#)

MOLECULES

Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – [32](#)

MOLYBDENUM

Parameter Comparison for Low-Noise MoAu TES Bolometers – [74](#)

MOMENTS

Computational Methods for Dynamic Stability and Control Derivatives – [14](#)

MOMENTUM TRANSFER

Measurements of the Meson-Photon Transition Form Factors of Light Pseudoscalar Mesons at Large Momentum Transfer – [174](#)

MOMENTUM

Soft Gluons in the Finite Momentum Wave Function and the BFKL Pomeron – [175](#)

MONITORS

Contract Representation for Run-Time Monitoring and Enforcement – [138](#)

EAGLE Monitors by Collecting Facts and Generating Obligations – [148](#)

Monitoring Cancer Oxygenation Changes Induced by Ultrasound – [122](#)

MONOCHROMATORS

Frequency Chirped SASE FEL – [178](#)

MONTE CARLO METHOD

WOPPER, Version 1.1: A Monte Carlo Event Generator for Four Fermion Production at LEP-II and Beyond – [166](#)

MOON

Cratering of the Moon – [231](#)

Explosive Volcanic Eruptions on the Moon – [227](#)

Phases of the Moon – [226](#)

The Moon Beyond 2002 – [227](#)

Uranus, Neptune, and the Mountains of the Moon – [226](#)

MOUNTAINS

Uranus, Neptune, and the Mountains of the Moon – [226](#)

MULTICHANNEL COMMUNICATION

High Coverage Multicasting for Mobile Ad-hoc Networks – [51](#)

MULTISPECTRAL BAND SCANNERS

Radiometric Characterization of IKONOS Multispectral Imagery – [77](#)

MULTISPECTRAL PHOTOGRAPHY

Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+ – [67](#)

MUONS

Muon Collier Design – [174](#)

MUTATIONS

Mechanism of Mutation in Non-Dividing Cells – [127](#)

NANOPARTICLES

Controlled Synthesis and Assembly of FePt Nanoparticles – [39](#)

Growth Induced Magnetic Anisotropy in Crystalline and Amorphous Thin Films – [38](#)

Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – [39](#)

X-Ray Absorption and Diffraction Studies of Magnetic Nanoparticle Assemblies – [26](#)

NANOSTRUCTURE (CHARACTERISTICS)

Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – [39](#)

X-Ray Studies of Magnetic Nanoparticle Assemblies – [172](#)

NANOSTRUCTURE GROWTH

Controlled Synthesis and Assembly of FePt Nanoparticles – [39](#)

NANOSTRUCTURES (DEVICES)

Fabrication and Modification of Metal and Semiconductor Nanostructures Using Atomic Force Microscope – [59](#)

Production of Nanocomposites – [29](#)

NANOTECHNOLOGY

Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – [32](#)

NARCOTICS

Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafuoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – [37](#)

NASA PROGRAMS

A Visual Database System for Image Analysis on Parallel Computers and its Application to the EOS Amazon Project – [159](#)

Business Modernization: Disciplined Processes Needed to Better Manage NASA's Integrated Financial Management Program – [15](#)

Crafting Flight: Aircraft Pioneers and the Contributions of the Men and Women of NASA Langley Research Center – [243](#)

Information Technology: Architecture Needed to Guide NASA's Financial Management Modernization – [15](#)

Moving NASA Remote Sensing Data to the GIS Environment for Health Studies – [77](#)

NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – [72](#)

PAIRS, The GIS-Based Incident Response System for Pennsylvania, and NASA – [91](#)

Quarterly Technical Progress Report of Radioisotope Power System Materials Production and Technology Program Tasks for January through March 2000 – [61](#)

ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – [19](#)

The Laboratory for Terrestrial Physics – [208](#)

NASA SPACE PROGRAMS

Design Rules for Life Support Systems – [137](#)

Essential Autonomous Science Inference on Rovers (EASIR) – [235](#)

Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – [147](#)

NASA's MERBoard: An Interactive Collaborative Workspace Platform – [235](#)

Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – [88](#)

Orbit Design for Phase I and II of the Magnetospheric Multiscale Mission (MMS) – [87](#)

SOFIA First Generation Science Instruments – [68](#)

NATURAL GAS

Performance and Economics of Catalytic Glow Plugs and Shields in Direct Injection Natural Gas Engines for the Next Generation Natural Gas Vehicle Program – [73](#)

NAVIGATION AIDS

Navigation and Vessel Inspection Circular No. 8-01, Change 1. CH-1 to NVIC 8-01, Approval of Navigation Equipment for Ships – [201](#)

NAVY

An Analysis of Implementation Issues for the Searchable Content Object Reference Model (SCORM) in Navy Education and Training – [204](#)

NEAR INFRARED RADIATION

An Empirical Decomposition of Near-IR Emission into Galactic and Extragalactic Components – [216](#)

NEBULAE

Disentangling X-Ray Emission Processes in Vela-Like Pulsars – 223

Formation of Primitive Bodies in the Protoplanetary Nebula – 218

NEOPLASMS

Development of an erbB Antagonist – 124

Expression of Transforming Growth Factor-Beta (TGF- β) in Prostate Cancer Progression – 135

Fibrinolysis in Tumor Associated Angiogenesis – 108

Molecular Characterization of Squamous Cell Carcinomas Derived From Recessive Dystrophic Epidermolysis Bullosa – 134

The Role of Neuropilin in Breast Cancer Metastasis – 119

NEPTUNE (PLANET)

The Kuiper Belt and Oort Cloud – 228

Uranus, Neptune, and the Mountains of the Moon – 226

NERVOUS SYSTEM

Oxidative Damage in Parkinson's Disease – 120

NETWORK ANALYSIS

LLAMA (Lincoln Laboratory Advanced MARTHA Applications) Software Manual – 154

NETWORK CONTROL

Performance Modeling of Network-Attached Storage Device Based Hierarchical Mass Storage Systems – 145

NEUROLOGY

Alpha Synuclein in a Model of Multiple System Atrophy – 130

NEUROPHYSIOLOGY

The Role of Neuropilin in Breast Cancer Metastasis – 119

NEUTRAL BEAMS

Advanced Tokamak Profile Evolution in DIII-D – 194

Resistive Wall Modes and Plasma Rotation in DIII-D – 192

NEUTRINOS

Determination of the Michel Parameters and the tau Neutrino Helicity in tau Decay – 200

Effective Mass of the Electron Neutrino in Beta Decay – 185

Search for Neutrinoless τ Decays Involving π^0 or η Mesons – 196

Tau Neutrino Helicity from h^+ plus or minus Energy Correlations – 178

NEUTRON DIFFRACTION

OSIRIS User Guide, 1st Edition – 173

NEUTRON SCATTERING

TOSCA User-Guide – 150

NEUTRON SOURCES

Development of Real-Time Measurement of Effective Dose for High Dose Rate Neutron Fields – 177

OSIRIS User Guide, 1st Edition – 173

NEUTRON SPECTROMETERS

TOSCA User-Guide – 150

NEUTRON STARS

Journey to the Center of a Neutron Star – 222

NEUTRONS

Neutronic Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997. Volume 4, Part 6-Esada Plutonium Program Critical Experiments: Power Distribution Measurements – 28

NICKEL ALLOYS

A Comparison of Biotic and Inorganic Sulfide Films – 34

A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – 42

Development of Nickel Alloy Substrates for Y-Ba-Cu-O Coated Conductor Applications – 38

HVOF Application of Nickel and Nickel Alloy to Tungsten Heavy Alloy for Jacketed Penetrators – 40

Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42

NITRATION

Investigations of Thaxtomin Biosynthesis – 115

NITRITES

Caustic-Side Solvent Extraction: Anticaking Surfactants Found to be Cause of Apparent Effect of High Nitrite Concentration on Cesium Stripping – 28

NOISE REDUCTION

E-3 In-Flight Acoustic Exposure Studies and Mitigation Via Active Noise Reduction Headset – 11

NOISE (SOUND)

Mental Representation of Auditory Sources – 184

NONDESTRUCTIVE TESTS

Evaluation of Cracking in Pre-Service and In-Service Snow Plow Carbide Wear Surfaces – 27

Nondestructive Evaluation of a Metal Matrix Composite – 30

NONLINEAR EQUATIONS

About Nonlinear Dependence of Remote Sensing and Diffuse Reflection Coefficients on Gordon's Parameter – 78

NONLINEAR SYSTEMS

About Nonlinear Dependence of Remote Sensing and Diffuse Reflection Coefficients on Gordon's Parameter – 78

Multiobject Robust Control of Nonlinear Systems via State Dependent Coefficient Representations and Applications – 162

Nonlinear Dynamics and Ergodic Theory Methods in Control – 64

NONLINEARITY

Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – 64

NUCLEAR MAGNETIC RESONANCE

A Training Program in Breast Cancer Research Using NMR Techniques – 113

Studies on the Novel Anticancer Agents Metabolically Formed from 17-Beta-Estradiol – 123

NUCLEAR PHYSICS

Advanced Accelerator Technologies: A Snowmass '96 Subgroup Summary – 170

NUCLEAR POWER PLANTS

Initial Screening of Thermochemical Water-Splitting Cycles for High Efficiency Generation of Hydrogen Fuels Using Nuclear Power – 32

NUCLEAR REACTORS

Hot Cell Facility (HCF) Safety Analysis Report – 186

Isolation of Microstructure in Proton-Irradiated Steels – 40

NUCLEOSIDES

P53 Regulation of Uridine Phosphorylase Activity, Pyrimidine Salvage Pathway and Their Effects on Breast Cancer Therapy – 109

NUCLEOTIDES

Direct Effects of Folate Metabolism on Gene Expression in Metastatic Breast Cancer – 133

Effect of a Single Nucleotide Polymorphism (NP) on Breast Cancer Invasion – 126

NUMERICAL ANALYSIS

Analytic Solution to the Problem of Aircraft Electric Field Mill Calibration – 162

Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control – 7

Normal Shock Vortex Interaction – 7

Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure – 3

Voltage Gradient Along a Lightning Channel During Strikes to Aircraft – 1

NUMERICAL WEATHER FORECASTING

Global Multispectral Cloud Retrievals from MODIS – 69

Leveraging Improvements in Precipitation Measuring from GPM Mission to Achieve Prediction Improvements in Climate, Weather and Hydrometeorology – 99

Recent Observing System Simulation Experiments at the NASA DAO – 101

OBESITY

Leptin (Obesity Protein) and Breast Cancer Metastasis – 129

OBSERVATION

AstroNet: A Tool Set for Simultaneous, Multi-Site Observations of Astronomical Objects – 211

OBSERVATORIES

The EUSO Mission – 215

Town Hall Meeting Presentation – 216

OCEAN DYNAMICS

Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104

OCEAN MODELS

Mean COAMPS Air-Sea Fluxes Over the Mediterranean During 1999 – 48

OCEAN SURFACE

Westerly Wind Events in the Eastern Indian Ocean as a Precursor to El Nino: A Case Study for the 2002-03 El Nino – 103

OCEANOGRAPHY

About Nonlinear Dependence of Remote Sensing and Diffuse Reflection Coefficients on Gordon's Parameter – 78

OCEANS

Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104

ONCOGENES

Genetic Requirements for the Transformation of Human Cells – 117

ON-LINE SYSTEMS

An On-line Technology Information System (OTIS) for Advanced Life Support – 207

Digital Economy, 2003 – 204

Multiobject Robust Control of Nonlinear Systems via State Dependent Coefficient Representations and Applications – 162

OORT CLOUD

The Kuiper Belt and Oort Cloud – 228

OPERATING COSTS

Verge of One Petabyte: The Story Behind the BaBar Database – 167

OPERATING SYSTEMS (COMPUTERS)

Execution-Based Model Checking of Interrupt-Based Systems – 157

OPERATIONAL PROBLEMS

Advanced Tokamak Operation Using the DIII-D Plasma Control System – 193

OPERATIONS RESEARCH

Air Transportation Network Routing and Scheduling – 9

Research Plan of the Operations Research Center and Department of Systems Engineering for Academic Year 2004 – 164

OPTICAL COMMUNICATION

Complete Characterization of a Chaotic Optical Field using a High-Gain Self-Amplified Free-Electron Laser – 188

Electronic Imaging: Propagation, Retrieval, Recognition – 70

OPTICAL EQUIPMENT

Aerosol Attenuation Model for Scandinavian Environment: Based on Measurements at Loevsæetra in Uppland – 138

Development of a Large-scale 3D MEMS Optical Switch Module – 187

High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 186

Integrated Optical Design Analysis (IODA): New Test Data and Modeling Features – 152

OPTICAL FIBERS

Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 55

OPTICAL FILTERS

A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 55

OPTICAL MEMORY (DATA STORAGE)

Holographic Optical Storage Using Photorefractive Polymers – 187

OPTICAL POLARIZATION

A Polarized Universe – 227

OPTICAL PROPERTIES

Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – 85

Optical Properties of the DIRC Fused Silica Cherenkov Radiator – 181

Tribometric Optical and Electrical Properties of Sputtered Quasicrystalline – 29

OPTICAL RELAY SYSTEMS

Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 49

OPTICAL SWITCHING

Recent Advances in Optical Switches Using Silica-based PLC Technology – 50

Recent Progress in Optical Switching Device Technologies in NTT – 49

OPTICS

A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188

OPTIMAL CONTROL

Orbit Design for Phase I and II of the Magnetospheric Multiscale Mission (MMS) – 87

OPTIMIZATION

Compiler Optimizations for Power-Aware Computing. Volume 1 of 2 – 153

COPPER: Compiler-Controlled On-Demand Approach to Power-Efficient Computing – 149

From Materials to Missions Assess-Predict-Optimize: A Computational Approach to Adaptive Design – 161

Optimizing IV and V for Mature Organizations – 153

OPTOELECTRONIC DEVICES

Ohio State University Cooperative Research and Development Agreement (CRDA) . Crystal Growth by Molecular Beam Epitaxy (MBE) and Characterization of Optoelectronic Devices – 72

Recent Progress in Optical Switching Device Technologies in NTT – 49

ORBITAL MECHANICS

Town Hall Meeting Presentation – 216

ORDNANCE

ManTech Journal. Guidelines for Defense Contractors. Volume 8/Number 2 – 9

Standardized UXO Technology Demonstration Site Blind Grid Scoring Record No. 50. Site Location: Aberdeen Proving Ground – 71

ORGANIC COMPOUNDS

Characterization of Soluble Organic in Produced Water – 35

Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation – 29

Organic Compounds in Martian Meteorites May be Terrestrial Contaminants – 228

ORGANIZATIONS

Optimizing IV and V for Mature Organizations – 153

ORION NEBULA

Baby Stars in Orion Solve Solar System Mystery – 214

OSCILLATIONS

More Hidden Black Hole Dangers – 229

Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – 64

OVARIES

Determining Effects of Genes, Environment, and Gene X Environment Interaction That Are Common to Breast and Ovarian Cancers Via Bivariate Logistic Regression – 125

OXIDATION

Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – 32

Evaluation of Emission Characteristics Downstream of Diesel Oxidation Catalyst Technology – 84

Oxidative Damage in Parkinson's Disease – 120

Toward an Understanding of Catalysis by Supported Metal Nanoclusters – 27

OXYGEN PRODUCTION

Oxygen: Not Just for Breathing Any more – [242](#)

OZONE

Insights into Tropical Tropospheric Ozone from the SHADOZ Network – [102](#)

Performance Evaluation of CMAQ and PM-CAMx for the July 1999 SOS Episode – [76](#)

Validation of Envisat Ozone Data Products using Satellite and Ground Based Data – [96](#)

PACKET SWITCHING

A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – [55](#)

Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – [49](#)

PAINTS

Laboratory Evaluation of Moisture Cure Urethane Coatings – [28](#)

PAIR PRODUCTION

Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – [200](#)

PARALLEL COMPUTERS

A Visual Database System for Image Analysis on Parallel Computers and its Application to the EOS Amazon Project – [159](#)

High Performance Computing Clusters, Constellations, MPPs, and Future Directions – [140](#)

High-Performance Input/Output Systems for Parallel Computers – [142](#)

PARALLEL PROCESSING (COMPUTERS)

Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications – [157](#)

Experimental Evaluation and Workload Characterization for High-Performance Computer Architectures – [139](#)

Task Assignment Heuristics for Parallel and Distributed CFD Applications – [65](#)

Understanding and Improving High-Performance I/O Subsystems – [145](#)

PARALLEL PROGRAMMING

An Expert System for the Development of Efficient Parallel Code – [152](#)

Performance Characteristics of the Multi-Zone NAS Parallel Benchmarks – [152](#)

PARAMAGNETISM

Magnetic Control of Solutal Buoyancy-driven Convection – [181](#)

PARASITIC DISEASES

Novel Lishmania and Malaria Potassium Channels: Candidate Therapeutic Targets – [110](#)

PARITY

High Power Liquid Hydrogen Target for Parity Violation Experiments – [171](#)

PARKINSON DISEASE

Alpha Synuclein in a Model of Multiple System Atrophy – [130](#)

Oxidative Damage in Parkinson's Disease – [120](#)

PARTICLE ACCELERATION

High-Energy Particle Acceleration in the Heliosphere – [224](#)

Solar and Solar Wind: High Energy Particle Acceleration in the Heliosphere – [239](#)

PARTICLE ACCELERATORS

Advanced Accelerator Technologies: A Snowmass '96 Subgroup Summary – [170](#)

Application Framework and Data Model Prototype for the BaBar Experiment – [198](#)

Maximum Acceptance Detector for the Fermilab Collider (MAX) – [200](#)

Model Independent Analysis of Beam Dynamics in Accelerators – [169](#)

Proposed Interim Improvement to the Tevatron Beam Position Monitors with Narrow Band Crystal Filters – [176](#)

Summary Report of Working Group 4: Electron Beam Driven Concepts – [198](#)

Symplecticity in Beam Dynamics: An Introduction – [171](#)

Theoretical Problems in Accelerator Physics, Progress Report – [168](#)

PARTICLE BEAMS

DIRC for a Higher Luminosity B Factory – [198](#)

PARTICLE COLLISIONS

DIRC for a Higher Luminosity B Factory – [198](#)

PARTICLE DECAY

Determination of the Michel Parameters and the tau Neutrino Helicity in tau Decay – [200](#)

First Observation of tau 3(pi)(eta)(nu sub tau) and tau f1 pi nu sub tau Decays – [198](#)

Inclusive Decays B arrow DX and B arrow D(*)X – [176](#)

Investigation of Semileptonic B Meson Decay to P-Wave Charm Mesons – [180](#)

Measurement of the Michel Parameters in Leptonic Decays of the Tau – [179](#)

Measurement of the Tau Lepton Lifetime – [171](#)

New Measurement of B D*Pion Branching Fractions – [198](#)

Observation of Exclusive Two-body B Decays to Kaons and Pions – [183](#)

Search for B --> Mu Anti-Muon-Neutrino Gamma and B --> e Anti-Electron-Neutrino Gamma – [180](#)

Search for Color-Suppressed B Hadronic Decay Processes with CLEO – [180](#)

Search for Inclusive b sl+l-l – [200](#)

Search for Neutrinoless tau Decays Involving pion(sup O) or eta Mesons – [196](#)

Search for Rare Charm Meson Decays at FNAL E791 – [169](#)

Study of Inclusive Semileptonic B Meson Decays with the BABAR Detector – [200](#)

Study of the Beta(sup O) Semileptonic Decay Spectrum at the upsilon(4S) Resonance – [184](#)

PARTICLES

Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – [192](#)

PARTICULATE SAMPLING

Guidelines for the Application of SEM/EDX Analytical Techniques to Particulate Matter Samples – [68](#)

PARTICULATES

Guidelines for the Application of SEM/EDX Analytical Techniques to Particulate Matter Samples – [68](#)

Performance Evaluation of CMAQ and PM-CAMx for the July 1999 SOS Episode – [76](#)

PARTONS

Structure Function Subgroup Summary – [170](#)

PATENT APPLICATIONS

Apparatus and Method for Calibrating Voltage Spike Waveforms – [55](#)

PATTERN REGISTRATION

Terrain Model Registration for Single Cycle Instrument Placement – [235](#)

PAYLOADS

Equivalent Mass versus Life Cycle Cost for Life Support Technology Selection – [136](#)

PENNSYLVANIA

PAIRS, The GIS-Based Incident Response System for Pennsylvania, and NASA – [91](#)

PERFORMANCE PREDICTION

Performance Modeling of Network-Attached Storage Device Based Hierarchical Mass Storage Systems – [145](#)

Scalability Analysis and Use of Compression at the Goddard DAAC and End-to-End MODIS Transfers – [144](#)

PERFORMANCE TESTS

A Performance Evaluation of the Cray X1 for Scientific Applications – [156](#)

Cold-Start and Warm-Up Driveability Performance of Hybrid Electric Vehicles Using Oxygenated Fuels: Piggyback Project to the Volatility Group Intermediate -Temperature Program (CM-138-02) – [23](#)

High-Performance Input/Output Systems for Parallel Computers – [142](#)

Model Checking Correctness Properties of Electronic Contracts – [139](#)

Performance Characteristics of the Multi-Zone NAS Parallel Benchmarks – [152](#)

- Quantitative Tests of ELMs as Intermediate Peeling-Ballooning Modes – [192](#)
- PERMEABILITY**
Ceramic Membranes for Hydrogen Production from Coal – [44](#)
- PERSONAL COMPUTERS**
PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – [3](#)
- PERSONNEL**
Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – [128](#)
- PERTURBATION THEORY**
Asymptotic Pade Approximant Predictions: up to Five Loops in QCD and SQCD – [174](#)
- PERTURBATION**
Triggering of Convection – [100](#)
- PETRI NETS**
Logic Synthesis Avoiding State Space Explosion – [139](#)
- PETROLEUM PRODUCTS**
Technical Report and Testing Protocol for Commercial Microbiological Amendment Testing and Evaluation – [208](#)
- PHASE LOCKED SYSTEMS**
Sub-1nm Patterning Accuracy via Spatial-Phase Locking – [60](#)
- PHASE TRANSFORMATIONS**
A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – [42](#)
- PHASED ARRAYS**
Image-Guided Surgery of Primary Breast Cancer Using Ultrasound Phased Arrays – [110](#)
- PHOBOS**
The Ph-D Project: Manned Expedition to the Moons of Mars – [233](#)
- PHOSPHORYLATION**
Cell Cycle Dependent Regulation of Human Progesterone in Breast Cancer – [114](#)
Functional Analysis of Interactions Between 53BP1, BRCA1 and p53 – [105](#)
Kinase Independent Functions of Cyclin D1 Which Contribute to its Oncogenic Potential In Vivo – [133](#)
Novel Inhibitors of FGF Signal Transduction in Breast Cancer: Targeting the FGFR Adapter Protein SNT-1 – [109](#)
- PHOTOCHROMISM**
Holographic Optical Storage Using Photorefractive Polymers – [187](#)
- PHOTODISSOCIATION**
Dissociative Ionization and Product Distributions of Benzene and Pyridine by Electron Impact – [38](#)
- PHOTOELECTRICITY**
Electronic Imaging: Propagation, Retrieval, Recognition – [70](#)
- PHOTOELECTRON SPECTROSCOPY**
Time-Resolved Photoelectron Spectroscopy of Oxidation on the Ti(0001) Surface – [33](#)
- PHOTOMAPPING**
Big Mountain, Big Landslide on Jupiter's Moon, Io – [232](#)
- PHOTOMETRY**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – [215](#)
- PHOTON BEAMS**
Combining Electron With Intensity Modulated Photon Beams for Breast Cancer – [123](#)
- PHOTONICS**
Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – [49](#)
- PHOTONS**
Instrumentation Facility for the Evaluation of Photonic and Opto-Electronic Materials – [59](#)
NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – [72](#)
The Optical Telescope – [213](#)
- PHOTOREFRACTIVITY**
Holographic Optical Storage Using Photorefractive Polymers – [187](#)
- PHOTOSYNTHESIS**
Supramolecular Structures for Photochemical Energy Conversion – [80](#)
- PHYSICS**
Initial Experiences with Retrieving Similar Objects in Simulation Data – [181](#)
- PHYSIOLOGY**
Center for Behavioral Research: Individual Interventions for Breast Cancer Patients – [124](#)
The Roles of FGF-2 TGF Beta and TGF Beta Receptor 2 in Breast Cancer Dormancy – [128](#)
- PLANETARY BOUNDARY LAYER**
Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – [85](#)
- PLANETARY EVOLUTION**
Origin of the Earth and Moon – [213](#)
- PLANETARY GEOLOGY**
Impact Craters in the Solar System – [233](#)
Life on Mars? – [230](#)
- PLANETARY MANTLES**
The Martian Interior – [230](#)
- PLANETARY ORBITS**
Kepler's Laws of Planetary Motion – [221](#)
- PLANETARY SURFACES**
Mercury Unveiled – [212](#)
- PLANETARY SYSTEMS**
The Laboratory for Terrestrial Physics – [208](#)
- PLANETS**
The Europa Scene in the Voyager-Galileo Era – [232](#)
The Stability of Orbital Configurations and the Ultimate Configurations of Planetary and Satellite Systems – [215](#)
- PLANNING**
How to Prepare a Startup, Shutdown, Malfunction Plan for Collection and Control Systems at Municipal Solid Waste Landfills – [82](#)
Plan-graph Based Heuristics for Conformant Probabilistic Planning – [141](#)
Scoping Planning Agents With Shared Models – [160](#)
- PLASMA ACCELERATION**
Plasma Dielectric Tensor for Non-Maxwellian Distributions in the FLR Limit – [182](#)
- PLASMA ACCELERATORS**
Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – [189](#)
- PLASMA BUBBLES**
Ionosphere and Thermosphere: Ionospheric Irregularities – [89](#)
Ionospheric Irregularities – [93](#)
- PLASMA CONTROL**
Advanced Tokamak Profile Evolution in DIII-D – [194](#)
Characteristics of the H-Mode Pedestal and Extrapolation to ITER – [191](#)
Discharge Improvement through Control of Neoclassical Tearing Modes by Localized ECCD in DIII-D – [192](#)
Maturing ECRF Technology for Plasma Control – [196](#)
- PLASMA CURRENTS**
Advanced Tokamak Profile Evolution in DIII-D – [194](#)
Demonstration in the DIII-D Tokamak of an Alternate Baseline Scenario for ITER and Other Burning Plasma Experiments – [190](#)
Stationary High-Performance Discharges in the DIII-D Tokamak – [190](#)
- PLASMA DENSITY**
ELM Particle and Energy Transport in the SOL and Divertor of DIII-D – [191](#)
Large Aspect Ratio Limit of Neoclassical Transport Theory – [181](#)
- PLASMA DIFFUSION**
Transport by Intermittency in the Boundary of the DIII-D Tokamak – [180](#)

PLASMA HEATING

Self-Consistent System of Equations for a Kinetic Description of the Low-Pressure Discharges Accounting for the Nonlocal and Collisionless Electron Dynamics – 193

PLASMA WAVES

Polar Plasma Wave Investigation Data Analysis in the Extended Mission – 218

PLASMAS (PHYSICS)

Advanced Tokamak Operation Using the DIII-D Plasma Control System – 193

Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – 195

Electrostatic Probe with Shielded Probe Insulator Tube for Low Disturbing Plasma Measurements in Hall Thrusters – 195

General Atomics Fusion Theory Program Annual Report for Fiscal Year 2002 – 191

Generation of Convection in the Magnetosphere-Ionosphere Coupling System – 93

Improved Conservation Properties for Particle-in-cell Simulations with Kinetic Electrons – 194

Investigations of Low and Moderate Harmonic Fast Wave Physics on CDX-U – 182

Large Aspect Ratio Limit of Neoclassical Transport Theory – 181

Multi-Grid Particle-in-cell Simulations of Plasma Microturbulence – 194

Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster – 189

Ring Around the Black Hole – 229

PNEUMATIC EQUIPMENT

Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings – 8

POINT IMPACT

Damage by Impact: The Case at Meteor Crater, Arizona – 209

POLARIMETRY

Gamma-ray Polarimetry – 224

POLARIZATION

New Measurement of B D*Pion Branching Fractions – 198

POLLUTION CONTROL

National Emission Standards for Hazardous Air Pollutants Surface Coating of Metal Cans. Background Information for Final Standards. Summary of Public Comments and Responses – 83

POLLUTION TRANSPORT

Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – 85

POLYCYCLIC AROMATIC HYDROCARBONS

A Molecular Model for Repression of BRCA-1 Transcription by the Aryl Hydrocarbon Receptor – 105

POLYMER MATRIX COMPOSITES

Aspects of the Mechanical Behavior of Stitched T300 Mat/Urethane 420 IMR Composite – 30

POLYMERS

Charge Transfer Polymers as Ultrafast Holographic Materials – 45

Coating and Mandrel Effects on Fabrication of Glow Discharge Polymer NIF Scale Indirect Drive Capsules – 177

Field-effect Flow Control in Polymer Microchannel Networks – 61

Holographic Optical Storage Using Photorefractive Polymers – 187

Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – 45

Polymer Light-Emitting Diode (PLED) Process Development – 57

POLYMETHYL METHACRYLATE

Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30

POLYMORPHISM

Effect of a Single Nucleotide Polymorphism (NP) on Breast Cancer Invasion – 126

POROSITY

Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25

POSITION (LOCATION)

Factors Affecting the Latitudinal Location of the Intertropical Convergence Zone in a GCM – 91

Objective Classification of Radar Profile Types, and Their Relationship to Lightning Occurrence – 52

Recursive Terrain Navigation. Application of the Correlation Method – 160

POSITRONS

Measurement of the total Cross Section for (positon)(Electron) at square root of $\sqrt{s}=10.52$ GeV – 170

Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – 200

POWER BEAMING

Model Independent Analysis of Beam Dynamics in Accelerators – 169

Symplecticity in Beam Dynamics: An Introduction – 171

PRECIPITATES

Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – 100

PRECIPITATION MEASUREMENT

Leveraging Improvements in Precipitation Measuring from GPM Mission to Achieve Prediction Improvements in Climate, Weather and Hydrometeorology – 99

PRECIPITATION (METEOROLOGY)

A Downscaling Analysis of the Urban Influence on Rainfall: TRMM Satellite Component AMS Conference on Satellite Meteorology and Oceanography – 98

Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space – 98

Goddard Cumulus Ensemble (GCE) Model: Application for Understanding Precipitation Processes – 90

Precipitation Chemistry Studies in India: A Search for Regional Patterns – 100

Regional Variability in Convection and Rain Retrievals from the TRMM Microwave Imager (TMI) – 101

PREDICTIONS

Predictors of Navy Attrition. II. A Demonstration of Potential Usefulness for Screening – 111

Solar and Solar Wind: Interplanetary Magnetic Flux Ropes – 89

Westerly Wind Events in the Eastern Indian Ocean as a Precursor to El Nino: A Case Study for the 2002-03 El Nino – 103

PRESSURE VESSELS

Effects of Markedly Increased Intravascular Pressure on the Volume-Flow Characteristics in Venous Vessels of Human Limbs – 1

Heavy Section Steel Irradiation Program Monthly Letter Status Report for March 2001 – 41

PREVENTION

Center for Behavioral Research: Individual Interventions for Breast Cancer Patients – 124

PROBABILITY THEORY

A Bayesian Model for the Analysis of Quantal Response Data – 163

MBR-A Computer Program for Performing Nonparametric Bayesian Analyses of Ordered Binomial Data – 163

Numerical Loading of a Maxwellian Probability Distribution Function – 176

Plan-graph Based Heuristics for Conformant Probabilistic Planning – 141

Probabilistic Dynamic Buckling of Smart Composite Shells – 75

PROBLEM SOLVING

Satellites as Sentinels for Climate and Health – 70

PRODUCT DEVELOPMENT

Radiant Temperature Nulling Radiometer and Polarization Enhanced Thermal Radiometer – 67

PROGNOSIS

Genetic Influences on Toxicity and Prognosis in Women Treated With Breast-Conserving Surgery and Radiation Therapy – 118

PROGRAM VERIFICATION (COMPUTERS)

A New Vortex Flow Experiment for Computer Code Validation – 150

EAGLE can do Efficient LTL Monitoring – 158

Execution-Based Model Checking of Interrupt-Based Systems – 157

Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147

Optimizing IV and V for Mature Organizations – 153

Rule-Based Runtime Verification – 158

Verification and Validation of Embedded Knowledge-Based Software Systems – 205

PROJECT PLANNING

General Atomics Fusion Theory Program Annual Report for Fiscal Year 2002 – 191

PROJECTILES

Projectile Aerodynamic Jump Due to Lateral Impulsives – 3

PROPOSALS

Theoretical Problems in Accelerator Physics, Progress Report – 168

PROPULSION SYSTEM CONFIGURATIONS

Combining Electric and Sail Propulsion for Interplanetary Sample Return – 60

Support of Integrated Health Management (IHM) through Automated Analyses of Flowfield-Derived Spectrographic Data – 23

PROPULSION SYSTEM PERFORMANCE

50 KW Class Krypton Hall Thruster Performance – 21

Support of Integrated Health Management (IHM) through Automated Analyses of Flowfield-Derived Spectrographic Data – 23

PROSTATE GLAND

Dynamic Tissue Culture from Prostate Biopsy Specimens as a model for Predicting Tumor Radiosensitivity to Ionizing Radiation Treatment – 126

Epidermal Growth Factor (EGF) Receptor Intron 1 CA Repeat Polymorphisms in African-American and Caucasian Males: Influence on Prostate Cancer Risk or Disease Progression and Interaction with Androgen Receptor CAG Repeat Polymorphisms – 107

Expression of Transforming Growth Factor-Beta (TGF- β) in Prostate Cancer Progression – 135

Growth Inhibitory and Stimulatory Signals in Prostate Cancer – 121

Improving Retroviral Vectors for Gene Therapy of Prostate Cancer – 133

In Vivo Testing of Chemopreventive Agents Using the Dog Model of Spontaneous Prostate Carcinogenesis – 104

Neoadjuvant Anti-Angiogenesis Therapy for Prostate Cancer – 127

Prostate Cancer in Nigerians, Jamaicans and U.S. Blacks – 205

Prostate Carcinoma Detection Using Combined Ultrasound, Elasticity, and Tissue Strain-Hardening Imaging – 126

The Prostate Expression Database (PEDB) – 106

PROTECTIVE COATINGS

Development of Oxidation Protection Coatings for Gamma Titanium Aluminide Alloys – 43

PROTEINS

Administration of Additional Phosphorylated Prolactin During Pregnancy Inhibits Mammary Ductal Branching and Promotes Premare Lobuloalveolus Development – 113

Leptin (Obesity Protein) and Breast Cancer Metastasis – 129

Mechanism by which p66 Shc Suppresses Breast Cancer Tumorigenicity – 129

The Role of a FGF-Binding Protein in Breast Cancer – 124

The Role of AKT1 in Mammary Tumorigenesis and Transformation – 128

PROTOCOL (COMPUTERS)

System Evaluation of Hardware and Software for a Streaming Multimedia Server Using the Multicasting Protocol – 149

PROTON IRRADIATION

Isolation of Microstructure in Proton-Irradiated Steels – 40

PROTOPLANETARY DISKS

High Resolution Imaging of Circumstellar Disks at Millimeter Wavelengths – 212

PROTOPLANETS

Formation of Primitive Bodies in the Protoplanetary Nebula – 218

PROTOTYPES

An Expert System for the Development of Efficient Parallel Code – 152

PROVING

Validation of the Parameterized Real-Time Ionospheric Specification Model (PRISM) – 87

Validation Report for the Celestial Background Scene Descriptor (CBSD) stellar Point Sources Model CBSKY4 – 211

PSYCHOLINGUISTICS

Development of an Instrument for Measuring Team Performance Potential – 137

PUBLIC HEALTH

Moving NASA Remote Sensing Data to the GIS Environment for Health Studies – 77

Working Toward a Healthy Planet – 135

PULSARS

Disentangling X-Ray Emission Processes in Vela-Like Pulsars – 223

Future Facilities for Gamma-Ray Pulsar Studies – 224

PULSED PLASMA THRUSTERS

Electrostatic Probe with Shielded Probe Insulator Tube for Low Disturbing Plasma Measurements in Hall Thrusters – 195

PYRIDINES

Dissociative Ionization and Product Distributions of Benzene and Pyridine by Electron Impact – 38

PYROLYSIS

Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37

QUANTUM CHROMODYNAMICS

Asymptotic Padé Approximant Predictions: up to Five Loops in QCD and SQCD – 174

Duality and Other Exotic Gauge Dynamics in Softly Broken Supersymmetric QCD – 171

Soft Gluons in the Finite Momentum Wave Function and the BFKL Pomeron – 175

Structure Function Subgroup Summary – 170

Two-Loop Helicity Amplitudes for Quark-Gluon Scattering in QCD and Gluino-Gluon Scattering in Supersymmetric Yang-Mills Theory – 197

QUANTUM EFFICIENCY

Hybrid Nanorod-Polymer Solar Cell – 80

QUANTUM ELECTRONICS

Solid State Research Quarterly Technical Report 2003:3 – 58

QUANTUM THEORY

Elementary Aharonov-Bohm System in Three Space Dimensions: Quantum Attraction with no Classical Force – 199

Noncommutative Geometry in M-Theory and Conformal Field Theory – 168

QUARKS

Journey to the Center of a Neutron Star – 222

Search for Bs Mixing with Inclusive Lepton Events at SLD – 167

Search for Inclusive $b \rightarrow sl+H$ – 200

Self-Energy of Improved Staggered Quarks – 199

- Study of Gluon versus Quark Fragmentation in Upsilon $gg(\gamma)$ and (positron)(electron) $q\bar{q}(\gamma)$ gamma square root of S equals 10 GeV – 184
- Two-Loop Helicity Amplitudes for Quark-Gluon Scattering in QCD and Gluino-Gluon Scattering in Supersymmetric Yang-Mills Theory – 197
- QUASI-BIENNIAL OSCILLATION**
Reversing Flows and Heat Spike: Caused by Solar g-Modes? – 76
- RACES (ANTHROPOLOGY)**
Tuberculosis Infection Among Young Adults Enlisting in the USA Navy – 130
- RADAR CROSS SECTIONS**
Dynamic RCS: A Geometrical/Eulerian Approach to Computing High Frequency Radar Cross Sections – 165
- RADIATION COUNTERS**
Fun Times with Cosmic Rays – 221
- RADIATION DETECTORS**
Analyses of D + K(sup O)(sub S) and D + K(sup O)(sub S)pi – 179
Distributed Offline Data Reconstruction in BABAR – 167
- RADIATION DISTRIBUTION**
Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstrator – 51
- RADIATION DOSAGE**
Development of Real-Time Measurement of Effective Dose for High Dose Rate Neutron Fields – 177
Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstrator – 51
- RADIATION PROTECTION**
Radiation Protection at High-Energy Electron Accelerators – 48
- RADIATION SPECTRA**
Aerosol Attenuation Model for Scandinavian Environment: Based on Measurements at Loevsætra in Uppland – 138
- RADIATION THERAPY**
Genetic Influences on Toxicity and Prognosis in Women Treated With Breast-Conserving Surgery and Radiation Therapy – 118
- RADIATION TOLERANCE**
Space Instruments: General Considerations – 20
- RADIATION TRANSPORT**
Working Toward a Healthy Planet – 135
- RADIATIVE TRANSFER**
Application of Radiative Transfer Techniques to Background Clutter Mitigation – 150
Regional Variability in Convection and Rain Retrievals from the TRMM Microwave Imager (TMI) – 101
Simulation of Transport Phenomena in Aluminum Nitride Single-Crystal Growth – 196
- RADICALS**
A Molecular Model for Repression of BRCA-1 Transcription by the Aryl Hydrocarbon Receptor – 105
- RADIO FREQUENCIES**
Image Systems Using RFID Tag Positioning Information – 54
Spot Information Navigator – 55
Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak – 192
- RADIO RECEIVERS**
INSPIRE – 222
- RADIO SIGNALS**
YMER User Guide – 51
- RADIO SOURCES (ASTRONOMY)**
Gamma-Ray Blazar Content of the Northern Sky – 223
- RADIO WAVES**
Ionosphere and Thermosphere: Ionospheric Irregularities – 89
Ionospheric Irregularities – 93
- RADIOACTIVE DECAY**
Effective Mass of the Electron Neutrino in Beta Decay – 185
- RADIOACTIVE WASTES**
Canister Transfer System Event Sequence Calculation – 202
- RADIOISOTOPE BATTERIES**
Quarterly Technical Progress Report of Radioisotope Power System Materials Production and Technology Program Tasks for January through March 2000 – 61
- RADIOMETERS**
Ece Radiometer Upgrade on the DIII-D Tokamak – 194
Radiant Temperature Nulling Radiometer and Polarization Enhanced Thermal Radiometer – 67
Radiometric Characterization of IKONOS Multispectral Imagery – 77
- RAIN**
A Downscaling Analysis of the Urban Influence on Rainfall: TRMM Satellite Component AMS Conference on Satellite Meteorology and Oceanography – 98
Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space – 98
Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – 100
NASA's Scientific Agenda for GPM Mission – 96
Regional Variability in Convection and Rain Retrievals from the TRMM Microwave Imager (TMI) – 101
Use of Collocated KWAJEX Satellite, Aircraft, and Ground Measurements for Understanding Ambiguities in TRMM Radiometer Rain Profile Algorithm – 96
- Westerly Wind Events in the Eastern Indian Ocean as a Precursor to El Nino: A Case Study for the 2002-03 El Nino – 103
- RAMAN SPECTRA**
Spectroscopy-Based Characterization of Single Wall Carbon Nanotubes – 46
- REACTOR TECHNOLOGY**
Temperature Swing Adsorption Compressor Development – 74
- REAL TIME OPERATION**
Geodata Modeling and Query in Geographic Information Systems – 144
Modeling and Analysis of Uncertain Time-Critical Tasking Problems (UTCTP) – 164
Real-Time Adaptive Control of Flow-Induced Cavity Tones – 62
Validation of the Paramaterized Real-Time Ionospheric Specification Model (PRISM) – 87
- RECEIVERS**
Time Synchronization of a TDA-Based Position Finding System – 61
- RECEPTORS (PHYSIOLOGY)**
Development of an erbB Antagonist – 124
Role of Nuclear Receptor Coactivators, AIB-1 and SRC-1, in the Development of Breast Cancer – 114
- RECOMBINATION REACTIONS**
Recombinational Repair Genes and Breast Cancer Risk – 112
- RED GIANT STARS**
The Sun – 213
- REFLECTANCE**
Design and Simulation of Transmission Properties of Hollow Bragg Fibers Fabricated from Omnidirectionally Reflective Composite Dielectric Materials – 58
- REFLECTION**
About Nonlinear Dependence of Remote Sensing and Diffuse Reflection Coefficients on Gordon's Parameter – 78
- REFLECTORS**
SLAC Design and Manufacturing Process of Sphere-Mounted Reflectors – 187
- REFRACTING TELESCOPES**
The Optical Telescope – 213
- REFRACTIVITY**
High-speed Switching Operation in a Thermocapillary Optical Switch for Application to Photonic Networks – 186
- REFRACTORIES**
The First Rock in the Solar System – 227
- REFRACTORY MATERIALS**
Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles – 75

REGULATIONS

Great Lakes Binational Toxics Strategy
U.S. Challenge on Alkyl-lead: Report on
Use of Alkyl-lead in Automotive Gasoline – [82](#)

REGULATORY MECHANISMS (BIOLOGY)

In Vivo Transcriptional Activation of Estrogen Receptor Target Genes: Differential Regulation in Mammary Gland Uterus and Bone – [118](#)

RELIABILITY ANALYSIS

High-Performance Input/Output Systems for Parallel Computers – [142](#)

Performance Analysis of the Unitree Central File – [146](#)

REMOTE SENSING

Moving NASA Remote Sensing Data to the GIS Environment for Health Studies – [77](#)

PAIRS, The GIS-Based Incident Response System for Pennsylvania, and NASA – [91](#)

Remote Sensing of Aerosol using MODIS, MODIS+CALIPSO and with the AEROSAT Concept – [97](#)

Remote Sensing – [78](#)

Satellites as Sentinels for Climate and Health – [70](#)

Working Toward a Healthy Planet – [135](#)

REMOTE SENSORS

About Nonlinear Dependence of Remote Sensing and Diffuse Reflection Coefficients on Gordon's Parameter – [78](#)

Radiant Temperature Nulling Radiometer and Polarization Enhanced Thermal Radiometer – [67](#)

REPRODUCTIVE SYSTEMS

Impact of Breast Cancer Treatments on Gonadal Function and Reproduction Health – [125](#)

RESEARCH AND DEVELOPMENT

Annual Report 2002 on Material Science and Technology – [27](#)

Experimental Evaluation and Workload Characterization for High-Performance Computer Architectures – [139](#)

Ohio State University Cooperative Research and Development Agreement (CRDA) . Crystal Growth by Molecular Beam Epitaxy (MBE) and Characterization of Optoelectronic Devices – [72](#)

Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – [205](#)

Telecommunication Networks for Mobile & Distributed Communications/ Computing – [52](#)

RESEARCH FACILITIES

Center of Excellence in Space Data and Information Sciences – [207](#)

Pellissier H5 Hydrostatic Level – [184](#)

Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – [206](#)

RESEARCH MANAGEMENT

Research Plan of the Operations Research Center and Department of Systems Engineering for Academic Year 2004 – [164](#)

RESEARCH PROJECTS

Annual Report 2002 on FOI's Research on Modelling and Simulation – [140](#)

RESEARCH

Electromagnetics Laboratory Annual Report 2002 – [172](#)

RESIDUAL STRENGTH

Review of Aeronautical Fatigue Investigations in Sweden During the Period June 2001 to April 2003 – [10](#)

RESONANCE

Experimental Measurement of Resonance Islands Induced by the RF Voltage Modulation – [175](#)

RESPIRATORS

Quick Assessment of the Navy Mark V CBR Respirator After 13 Years in Storage – [137](#)

RETARDING

Complete Suppression of the $m=2/n=1$ Neoclassical Tearing Mode using Electron Cyclotron Current Drive on DIII-D – [178](#)

REUSABLE LAUNCH VEHICLES

Advanced Guidance and Control for Hypersonics and Space Access – [16](#)

Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles – [75](#)

REYNOLDS NUMBER

Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – [66](#)

RIVER BASINS

Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – [100](#)

ROBOTICS

Compilation of Technical Papers Published Under Work Unit 72312501 (71844501) 'Acceleration Performance in Advanced Operational Systems,' 1985-2000 – [205](#)

Mission Simulation Facility: Simulation Support for Autonomy Development – [160](#)

ROBOTS

Shared Semantic Representations for Coordinating Distributed Robot Teams – [151](#)

ROCKET ENGINES

Ageing Control Number 3 of Propellants for Rocket Motors RB 75 Maverick – [46](#)

ROCKET EXHAUST

Exhaust Simulation Testing of a Hypersonic Airbreathing Model at Transonic Speeds – [13](#)

ROCKS

Cratering of the Moon – [231](#)

Dirty Ice on Mars – [229](#)

Intercomparison of Numerical Simulation Codes for Geologic Disposal of CO₂ – [84](#)

Meteorites from Mars, Rocks from Canada – [231](#)

Rules for Identifying Ancient Life – [76](#)

ROTARY WING AIRCRAFT

Demonstration of the Ability of RCAS to Model Wind Turbines – [2](#)

ROTATION

Resistive Wall Modes and Plasma Rotation in DIII-D – [192](#)

ROTOR AERODYNAMICS

Effects of Blade Sweep on V-22 Whirl Flutter and Loads – [10](#)

ROTOR BLADES (TURBOMACHINERY)

Effects of Blade Sweep on V-22 Whirl Flutter and Loads – [10](#)

ROVING VEHICLES

Mission Simulation Facility: Simulation Support for Autonomy Development – [160](#)

Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – [206](#)

RUN TIME (COMPUTERS)

Contract Representation for Run-Time Monitoring and Enforcement – [138](#)

Rule-Based Runtime Verification – [158](#)

SAFETY FACTORS

Bromine Safety – [81](#)

SAFETY MANAGEMENT

Hot Cell Facility (HCF) Safety Analysis Report – [186](#)

SAMPLE RETURN MISSIONS

Combining Electric and Sail Propulsion for Interplanetary Sample Return – [60](#)

Genesis Discovery Mission: Science Canister Processing at JSC – [237](#)

Genesis Solar-Wind Sample Return Mission: The Materials – [237](#)

The Genesis Mission: An Overview – [236](#)

The Genesis Solar Wind Sample Return Mission – [236](#)

SANITATION

Example Moisture Mass Balance Calculations for Bioreactor Landfills – [83](#)

SATELLITE ATTITUDE CONTROL

ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – [19](#)

SATELLITE CONSTELLATIONS

Three Corner Sat Constellation – 16

SATELLITE IMAGERY

Derivation of a Tasseled Cap Transformation Based on Landsat 7 At-Satellite Reflectance – 15

Monthly Report of the Meteorological Satellite Center: August 2003 – 94

Monthly Report of the Meteorological Satellite Center: July 2003 – 94

Radiometric Characterization of IKONOS Multispectral Imagery – 77

Use of IKONOS Data for Mapping Cultural Resources of Stennis Space Center, Mississippi – 79

SATELLITE INSTRUMENTS

Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – 88

SATELLITE LASER RANGING

NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – 72

SATELLITE OBSERVATION

Monthly Report of the Meteorological Satellite Center: August 2003 – 94

Monthly Report of the Meteorological Satellite Center: July 2003 – 94

Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – 88

SORCE and Future Satellite Observations of Solar Irradiance – 239

Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+ – 67

SATELLITE SOUNDING

Monthly Report of the Meteorological Satellite Center: August 2003 – 94

Monthly Report of the Meteorological Satellite Center: July 2003 – 94

SATELLITE-BORNE INSTRUMENTS

Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – 20

Validation of Envisat Ozone Data Products using Satellite and Ground Based Data – 96

SATURATION

Perturbation Expansion for High-Gain Free-Electron Laser Saturation – 72

SCALE (RATIO)

Development of a Large-scale 3D MEMS Optical Switch Module – 187

SCANNING ELECTRON MICROSCOPY

Cylindrical Wire Electrical Discharge Machining of Metal Bond Diamond Wheels Part II: Wheel Wear Mechanism – 45

Guidelines for the Application of SEM/EDX Analytical Techniques to Particulate Matter Samples – 68

SCANNING

Preliminary Observations Regarding LDV Scans of Panels Excited by Broadband Actuators at the US Capitol – 72

Sub-1nm Patterning Accuracy via Spatial-Phase Locking – 60

SCATTERING CROSS SECTIONS

Measurements of the Meson-Photon Transition Form Factors of Light Pseudoscalar Mesons at Large Momentum Transfer – 174

SCHEDULES

Observations on SOFIA Observation Scheduling: Search and Inference in the Face of Discrete and Continuous Constraints – 202

SCHEDULING

A Comparison of Techniques for Scheduling Fleets of Earth-Observing Satellites – 202

Scheduling in the Face of Uncertain Resource Consumption and Utility – 202

SCIENTIFIC SATELLITES

GRACE: Gravity Recovery and Climate Experiment – 86

SCINTILLATION

Ionospheric Irregularities – 93

SEA WATER

About Nonlinear Dependence of Remote Sensing and Diffuse Reflection Coefficients on Gordon's Parameter – 78

SEEDS

Finite-Duration Seeding Effects in Powerful Backward Raman Amplifiers – 183

SEISMIC WAVES

A Plan of Development for Detection Systems for Seismic and Infrasound Arrays – 87

SELF ASSEMBLY

X-Ray Absorption and Diffraction Studies of Magnetic Nanoparticle Assemblies – 26

SEMICONDUCTOR DEVICES

Diamond Semiconductors Operate at Highest Frequency Ever: A Step Closer to Diamond Devices for Communication Satellites, Broadcasting Stations, and Radars – 54

NTT Technical Review – 53

SEMICONDUCTOR LASERS

High Power Mid-IR Semiconductor Lasers for LADAR – 71

SEMICONDUCTORS (MATERIALS)

Fabrication and Modification of Metal and Semiconductor Nanostructures Using Atomic Force Microscope – 59

Gamma-ray Polarimetry – 224

Monolithically Integrated 64-channel WDM Channel Selector – 54

Tri-Services Workshop on Process Induced Defects in Wide Bandgap Semiconductors – 59

SENSITIVITY

Monolithically Integrated 64-channel WDM Channel Selector – 54

The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59

SENSORS

Automated Data Processing as an AI Planning Problem – 69

Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation – 159

Hydrotechnics in Situ Flow Sensor – 64

Observations and Calibrations of DMSP F15 SSM Data December 1999 - October 2000 – 48

SEYFERT GALAXIES

Emission Line Galaxies in the STIS Parallel Survey – 217

Variability of Accretion Flow in the Core of the Seyfert Galaxy NGC 4151 – 218

SHELLS (STRUCTURAL FORMS)

Probabilistic Dynamic Buckling of Smart Composite Shells – 75

SHIELDING

Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – 70

Electrostatic Probe with Shielded Probe Insulator Tube for Low Disturbing Plasma Measurements in Hall Thrusters – 195

Radiation Protection at High-Energy Electron Accelerators – 48

SHIPS

Marine Vortices and Their Computation – 64

Navigation and Vessel Inspection Circular No. 8-01, Change 1. CH-1 to NVIC 8-01, Approval of Navigation Equipment for Ships – 201

Ship Shock Trial Modeling and Simulation of USS WINSTON S. CHURCHILL (DDG 81) – 149

SHOCK RESISTANCE

An Assessment of the Potential for Increasing the Salvageability of Critical Combat Traumas Through First Responder Interventions – 132

SHOCK TESTS

Ship Shock Trial Modeling and Simulation of USS WINSTON S. CHURCHILL (DDG 81) – 149

SHOCK WAVE INTERACTION

Normal Shock Vortex Interaction – 7

SIGNAL PROCESSING

Precision Structural Mechanics Instrumentation System – 157

Signal Processing for Acoustic Communications in Underwater Channels using Quadrature Amplitude Modulation – 50

SIGNS AND SYMPTOMS

Are Gulf War Veterans Experiencing Illness Due to Exposure to Smoke from Kuwaiti Oil Well Fires? Examination of Department of Defense Hospitalization Data – [131](#)

SILICA GLASS

Optical Properties of the DIRC Fused Silica Cherenkov Radiator – [181](#)

SILICON CARBIDES

C/SiC Life Prediction for Propulsion Applications – [31](#)

SIMULATION

Annual Report 2002 on FOI:s Research on Modelling and Simulation – [140](#)

Computational Methods for Dynamic Stability and Control Derivatives – [14](#)

Electrical Equivalent Circuit Simulations of the Pulsed-Power Conditioning System TTHPM – [56](#)

Multi-Grid Particle-in-cell Simulations of Plasma Microturbulence – [194](#)

Recent Observing System Simulation Experiments at the NASA DAO – [101](#)

SINGLE CRYSTALS

Simulation of Transport Phenomena in Aluminum Nitride Single-Crystal Growth – [196](#)

SINGULARITY (MATHEMATICS)

Stringy Resolutions of Null Singularities – [179](#)

SINTERING

Thermal Conductivity Evolution During Initial Stage Sintering – [28](#)

SMART MATERIALS

Probabilistic Dynamic Buckling of Smart Composite Shells – [75](#)

SMOKE

Are Gulf War Veterans Experiencing Illness Due to Exposure to Smoke from Kuwaiti Oil Well Fires? Examination of Department of Defense Hospitalization Data – [131](#)

SNC METEORITES

Meteorites from Mars, Rocks from Canada – [231](#)

SODIUM

Caustic-Side Solvent Extraction: Anti-Caking Surfactants Found to be Cause of Apparent Effect of High Nitrite Concentration on Cesium Stripping – [28](#)

SOFIA (AIRBORNE OBSERVATORY)

Observations on SOFIA Observation Scheduling: Search and Inference in the Face of Discrete and Continuous Constraints – [202](#)

SOFIA First Generation Science Instruments – [68](#)

SOFTWARE DEVELOPMENT TOOLS

AstroNet: A Tool Set for Simultaneous, Multi-Site Observations of Astronomical Objects – [211](#)

Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – [147](#)

Software Surveyor – [148](#)

SOFTWARE ENGINEERING

A Publish/Subscribe Based Architecture of an Alert Server to Support Prioritized and Persistent Alerts – [143](#)

Applying Jlint to Space Exploration Software – [153](#)

Optimizing IV and V for Mature Organizations – [153](#)

SOILS

Life on Mars? – [230](#)

SOLAR ACTIVITY

Coronal Heating, Spicules, and Solar-B – [238](#)

SOLAR CELLS

Hybrid Nanorod-Polymer Solar Cell – [80](#)

Thirteenth Workshop on Crystalline Silicon Solar Cell Materials and Processes. Extended Abstracts and Papers – [79](#)

SOLAR CORONA

Coronal Heating, Spicules, and Solar-B – [238](#)

SOLAR ELECTRIC PROPULSION

SEP Mission to Titan NEXT Aerocapture In-Space Propulsion (Quicktime Movie) – [24](#)

SOLAR ENERGY

Supramolecular Structures for Photochemical Energy Conversion – [80](#)

The Potential for solar Heat for Industrial Processes: A Preliminary Study of Swedish Possibilities – [80](#)

SOLAR FLARES

Eruption of a Multiple-Turn Helical Magnetic Flux Tube in a Large Flare: Evidence for External and Internal Reconnection that Fits the Breakout Model of Solar Magnetic Eruptions – [238](#)

Flux Rope Acceleration and Enhanced Magnetic Reconnection Rate – [220](#)

High-Energy Particle Acceleration in the Heliosphere – [224](#)

Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards – [239](#)

Review of the Communications Research Laboratory – [88](#)

Solar and Solar Wind: Energy Build-up Study of Solar Flares – [239](#)

Study of Energy Build-up in Solar Flares – [240](#)

SOLAR MAGNETIC FIELD

Eruption of a Multiple-Turn Helical Magnetic Flux Tube in a Large Flare: Evidence for External and Internal Reconnection that Fits the Breakout Model of Solar Magnetic Eruptions – [238](#)

Interplanetary Magnetic Flux Ropes – [241](#)

SOLAR NEBULA

Cratering of the Moon – [231](#)

SOLAR OSCILLATIONS

Reversing Flows and Heat Spike: Caused by Solar g-Modes? – [76](#)

SOLAR RADIATION

SORCE and Future Satellite Observations of Solar Irradiance – [239](#)

SOLAR SPECTRA

SORCE and Future Satellite Observations of Solar Irradiance – [239](#)

SOLAR SYSTEM EVOLUTION

The First Rock in the Solar System – [227](#)

SOLAR SYSTEM

Baby Stars in Orion Solve Solar System Mystery – [214](#)

Combining Electric and Sail Propulsion for Interplanetary Sample Return – [60](#)

Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – [17](#)

Europa and Titan: Oceans in the Outer Solar System? – [209](#)

Genesis Discovery Mission: Science Canister Processing at JSC – [237](#)

Spectral Models of Kuiper Belt Objects and Centaurs – [216](#)

SOLAR TRANSITION REGION

RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – [241](#)

SOLAR WIND

Conjugate Auroral Imagery – [91](#)

Formation of the Magnetosphere and Magnetospheric Plasma Regime – [241](#)

Genesis Discovery Mission: Science Canister Processing at JSC – [237](#)

Genesis Solar-Wind Sample Return Mission: The Materials – [237](#)

Geomagnetic Storms – [240](#)

Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards – [239](#)

Magnetosphere: Formation of the Magnetosphere and Magnetospheric Plasma Regime – [89](#)

Polar Plasma Wave Investigation Data Analysis in the Extended Mission – [218](#)

Review of the Communications Research Laboratory – [88](#)

Solar and Solar Wind: Solar Wind and Interplanetary Disturbances – [239](#)

Solar Wind and Interplanetary Disturbances – [240](#)

The Genesis Solar Wind Sample Return Mission – [236](#)

SOL-GEL PROCESSES

Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0004: Advanced Sol-Gel Adhesion Processes – 44

SOLID STATE

Solid State Research Quarterly Technical Report 2003:3 – 58

SOLUTES

Magnetic Control of Solutal Buoyancy-driven Convection – 63

Ultrafast Infrared Studies of Complex Ligand Rearrangements in Solution – 34

SOLVENT EXTRACTION

Hydrolysis of Levinstein Mustard (H) – 36

SOLVENTS

Ultrafast Infrared Studies of Complex Ligand Rearrangements in Solution – 34

SONDES

Insights into Tropical Tropospheric Ozone from the SHADOZ Network – 102

SOUND DETECTING AND RANGING

Precision Structural Mechanics Instrumentation System – 157

SOUND TRANSMISSION

Signal Processing for Acoustic Communications in Underwater Channels using Quadrature Amplitude Modulation – 50

SOUNDING ROCKETS

A Sounding Rocket Attitude Determination Algorithm Suitable for Implementation Using Low Cost Sensors – 161

SOUTHERN HEMISPHERE

Insights into Tropical Tropospheric Ozone from the SHADOZ Network – 102

SPACE EXPLORATION

Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles – 21

Applying JIInt to Space Exploration Software – 153

Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17

SPACE MISSIONS

Fuel Cells for Space Science Applications – 79

Mission Simulation Facility: Simulation Support for Autonomy Development – 160

SORCE and Future Satellite Observations of Solar Irradiance – 239

ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – 19

The EUSO Mission – 215

SPACE OBSERVATIONS (FROM EARTH)

The Center of the Galaxy – 214

SPACE PLASMAS

End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – 80

Formation of the Magnetosphere and Magnetospheric Plasma Regime – 241

SPACE POWER REACTORS

High Temperature Fusion Reactor Cooling Using Brayton Cycle Based Partial Energy Conversion – 22

SPACE SHUTTLE BOOSTERS

Space Shuttle Main Engine Implications for the Abort-to-Orbit Off-the-Pad Study – 24

SPACE SHUTTLE MAIN ENGINE

Space Shuttle Main Engine Implications for the Abort-to-Orbit Off-the-Pad Study – 24

SPACE SHUTTLES

Business Modernization: Disciplined Processes Needed to Better Manage NASA's Integrated Financial Management Program – 15

SPACE TRANSPORTATION SYSTEM

Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles – 75

SPACE WEATHER

High-Energy Particle Acceleration in the Heliosphere – 224

Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards – 239

Magnetosphere: Space Weather Research with Computer Simulations – 89

Solar Wind and Interplanetary Disturbances – 240

Space Weather and its Hazards on the High-Tech System – 240

Space Weather Research with Computer Simulations – 154

Study of Energy Build-up in Solar Flares – 240

SPACEBORNE ASTRONOMY

AstroNet: A Tool Set for Simultaneous, Multi-Site Observations of Astronomical Objects – 211

SPACEBORNE EXPERIMENTS

STS-107 Mission Highlights Resource, Part 2 of 4 – 17

The EUSO Mission – 215

SPACEBORNE TELESCOPES

Town Hall Meeting Presentation – 216

SPACECRAFT CONTROL

Space Weather: The Invisible Foe – 209

SPACECRAFT DESIGN

Three Corner Sat Constellation – 16

SPACECRAFT ENVIRONMENTS

Design Rules for Life Support Systems – 137

SPACECRAFT EQUIPMENT

Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – 20

SPACECRAFT LAUNCHING

Equivalent Mass versus Life Cycle Cost for Life Support Technology Selection – 136

SPACECRAFT ORBITS

Orbit Design for Phase I and II of the Magnetospheric Multiscale Mission (MMS) – 87

SPACECRAFT POWER SUPPLIES

Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – 18

SPACECRAFT PROPULSION

C/SiC Life Prediction for Propulsion Applications – 31

Investigation of the Erosion Characteristics of a Laboratory Hall Thruster – 22

SPACECREWS

STS-107 Mission Highlights Resource, Part 2 of 4 – 17

SPACE-TIME FUNCTIONS

Brief History of Gyroscopes – 178

Stringy Resolutions of Null Singularities – 179

SPECTRAL BANDS

Spectral Models of Kuiper Belt Objects and Centaurs – 216

SPECTRAL REFLECTANCE

Spectral Models of Kuiper Belt Objects and Centaurs – 216

SPECTRA

Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – 97

Study of the Beta(sup 0) Semileptonic Decay Spectrum at the upsilon(4S) Resonance – 184

SPECTROSCOPY

Photon-Counting Single-Molecule Spectroscopy for Studying Conformational Dynamics and Macromolecular Interactions – 32

RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – 241

SPICULES

Coronal Heating, Spicules, and Solar-B – 238

SPONTANEOUS EMISSION

Complete Characterization of a Chaotic Optical Field using a High-Gain Self-Amplified Free-Electron Laser – 188

STABILITY

Single-Mode Coherent Synchrotron Radiation Instability – 182

- The Stability of Orbital Configurations and the Ultimate Configurations of Planetary and Satellite Systems – 215
- Thermal Conductivity and Stability of $\text{HfO}_2\text{-Y}_2\text{O}_3$ and $\text{La}_2\text{Zr}_2\text{O}_7$ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – 25
- STAINLESS STEELS**
- Examination of Compatibility of Cavitation-Resistance Modifications to Type 316LN Stainless Steel in a Mercury Thermal Convection Loop – 39
- Screening Test Results of Fatigue Properties of Type 316LN Stainless Steel in Mercury – 41
- STANDARD MODEL (PARTICLE PHYSICS)**
- B System as a Window to New Physics – 183
- STANDARDS**
- National Emission Standards for Hazardous Air Pollutants Surface Coating of Metal Cans. Background Information for Final Standards. Summary of Public Comments and Responses – 83
- STAR FORMATION**
- Baby Stars in Orion Solve Solar System Mystery – 214
- STARBURST GALAXIES**
- How to Build a Supermassive Black Hole – 221
- STATISTICAL ANALYSIS**
- Are the Energy Analysis (EA) and the Statistical Energy Analysis (SEA) compatible? – 164
- STATISTICAL DISTRIBUTIONS**
- Global Multispectral Cloud Retrievals from MODIS – 69
- STEADY STATE**
- Achieving and Sustaining Steady-State Advanced Tokamak Conditions on DIII-D – 190
- Advanced Tokamak Profile Evolution in DIII-D – 194
- STEALTH TECHNOLOGY**
- FOI/FFA 2002 Research on Missiles, Stealth Technology and UAVs, Complementary FMV 250180-LB604516 – 66
- STEELS**
- Heavy Section Steel Irradiation Program Monthly Letter Status Report for March 2001 – 41
- STELLAR COMPOSITION**
- Journey to the Center of a Neutron Star – 222
- STELLAR ENVELOPES**
- High Resolution Imaging of Circumstellar Disks at Millimeter Wavelengths – 212
- STEREOSCOPIC VISION**
- Terrain Model Registration for Single Cycle Instrument Placement – 235
- STIMULATION**
- Center for Behavioral Research: Individual Interventions for Breast Cancer Patients – 124
- The Role of Neuropilin in Breast Cancer Metastasis – 119
- STIRLING ENGINES**
- Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – 18
- STORAGE RINGS (PARTICLE ACCELERATORS)**
- Analyses of $D + K(\sup O)(\sub S)$ and $D + K(\sup O)(\sub S)\pi$ – 179
- Muon Collier Design – 174
- Observation of the Dynamic Beta Effect CESR with CLEO – 182
- Symplectic Beam-Beam Interaction with Energy Change – 166
- Tau Neutrino Helicity from h plus or minus Energy Correlations – 178
- STORAGE**
- Performance Modeling of Network-Attached Storage Device Based Hierarchical Mass Storage Systems – 145
- STORMS**
- Formation of the Magnetosphere and Magnetospheric Plasma Regime – 241
- STRAIN HARDENING**
- Prostate Carcinoma Detection Using Combined Ultrasound, Elasticity, and Tissue Strain-Hardening Imaging – 126
- STRAIN MEASUREMENT**
- Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature – 186
- STREAMS**
- Possible Stick-Slip Mechanism for Whirlans Ice Stream – 92
- STRESS ANALYSIS**
- Modified Involute Helical Gears: Computerized Design, Simulation of Meshing and Stress Analysis – 147
- STRING THEORY**
- Brane Gas Cosmology, M-Theory and Little String Theory – 234
- Calabi-Yau Black Holes – 222
- Counting Schwarzschild and Charged Black Holes – 220
- de Sitter Vacua in String Theory – 168
- Geometry, Topology and String Theory – 175
- Stringy Resolutions of Null Singularities – 179
- STU Black Holes and String Trialities – 220
- STRUCTURAL ANALYSIS**
- A New Modular Approach for Tightly Coupled Fluid/Structure Analysis – 63
- Structural Evaluation of Exo-Skeletal Engine Fan Blades – 75
- STRUCTURAL ENGINEERING**
- Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles – 75
- STRUCTURAL FAILURE**
- Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure – 3
- STRUCTURAL MEMBERS**
- Precision Structural Mechanics Instrumentation System – 157
- STRUCTURAL VIBRATION**
- Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – 18
- STUDENTS**
- A Training Program in Breast Cancer Research Using NMR Techniques – 113
- STYRENES**
- Coating and Mandrel Effects on Fabrication of Glow Discharge Polymer NIF Scale Indirect Drive Capsules – 177
- The Specific Refractive Index Increment for Isobutyl Poly-Styrene Copolymers – 37
- SUBMARINES**
- Marine Vortices and Their Computation – 64
- SUBSONIC SPEED**
- Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – 6
- SULFATES**
- A Comparison of Biotic and Inorganic Sulfide Films – 34
- SUN**
- The Sun – 213
- SUPERCOMPUTERS**
- Performance Characteristics of the Multi-Zone NAS Parallel Benchmarks – 152
- SUPERCONDUCTING FILMS**
- Properties of Doped Bi-Based Superconductors – 197
- SUPERCONDUCTORS (MATERIALS)**
- Elementary Aharonov-Bohm System in Three Space Dimensions: Quantum Attraction with no Classical Force – 199
- Passive Superconducting Shielding: Experimental Results and Computer Models – 197
- SUPERGRAVITY**
- Supersymmetric Rotating Black Holes and Attractors – 219
- SUPERNOVA REMNANTS**
- Disentangling X-Ray Emission Processes in Vela-Like Pulsars – 223
- SUPERNOVAE**
- Supernovae and the Accelerating Universe – 217

SUPERSONIC COMBUSTION RAMJET ENGINES

Exhaust Simulation Testing of a Hypersonic Airbreathing Model at Transonic Speeds – [13](#)

SUPERSONIC FLOW

Normal Shock Vortex Interaction – [7](#)

Science and Technology Text Mining: Hypersonic and Supersonic Flow – [203](#)

SUPERSONIC SPEED

An Experimental and Computational Study of the Aerodynamics of a Square Cross-Section Body at Supersonic Speeds – [160](#)

SUPERSONIC TRANSPORTS

Optimum Climb to Cruise Noise Trajectories for the High Speed Civil Transport – [9](#)

SUPERSYMMETRY

B System as a Window to New Physics – [183](#)

Chiral Rings, Mirror Symmetry and the Fate of Localized Tachyons – [169](#)

de Sitter Vacua in String Theory – [168](#)

Supersymmetric Rotating Black Holes and Attractors – [219](#)

SUPPRESSORS

Molecular Characterization of Squamous Cell Carcinomas Derived From Recessive Dystrophic Epidermolysis Bullosa – [134](#)

SURFACE ROUGHNESS

Remote Sensing – [78](#)

SURFACE TREATMENT

Antimicrobial Surface Treatments of Aluminium in Air Conditioning Systems – [43](#)

SURFACTANTS

Caustic-Side Solvent Extraction: Anticaking Surfactants Found to be Cause of Apparent Effect of High Nitrite Concentration on Cesium Stripping – [28](#)

SURGERY

Genetic Influences on Toxicity and Prognosis in Women Treated With Breast-Conserving Surgery and Radiation Therapy – [118](#)

SURVEYS

Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – [128](#)

Use of IKONOS Data for Mapping Cultural Resources of Stennis Space Center, Mississippi – [79](#)

SURVIVAL

The Role of AKT1 in Mammary Tumorigenesis and Transformation – [128](#)

The Role of Neuropilin in Breast Cancer Metastasis – [119](#)

SWEEP ANGLE

Effects of Blade Sweep on V-22 Whirl Flutter and Loads – [10](#)

SWITCHES

Development of a Large-scale 3D MEMS Optical Switch Module – [187](#)

SWITCHING CIRCUITS

Recent Advances in Optical Switches Using Silica-based PLC Technology – [50](#)

SWITCHING

High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – [186](#)

Monolithically Integrated 64-channel WDM Channel Selector – [54](#)

SYMMETRY

Chiral Rings, Mirror Symmetry and the Fate of Localized Tachyons – [169](#)

STU Black Holes and String Triality – [220](#)

Weakly-Coupled Higgs Bosons and Precision Electroweak Physics – [170](#)

SYMPATHETIC NERVOUS SYSTEM

Alpha Synuclein in a Model of Multiple System Atrophy – [130](#)

SYNCHRONISM

Logic Synthesis Avoiding State Space Explosion – [139](#)

Phase-Synchronized Modal Testing of Mirror Membrane – [188](#)

SYNCHRONOUS SATELLITES

A Role for Improved Angular Observations in Geosynchronous Orbit Determination – [17](#)

SYNCHROTRON RADIATION

Calculation of the Coherent Synchrotron Radiation Impedance from a Wiggler – [173](#)

Single-Mode Coherent Synchrotron Radiation Instability – [182](#)

SYNCHROTRONS

Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – [42](#)

Experimental Measurement of Resonance Islands Induced by the RF Voltage Modulation – [175](#)

SYNTHESIS (CHEMISTRY)

Controlled Synthesis and Assembly of FePt Nanoparticles – [39](#)

SYNTHETIC APERTURE RADAR

Synthetic Aperture Radar (SAR) Automatic Target Recognition (ATR) parametric Study – [68](#)

SYSTEMS ANALYSIS

Pre-Game-Theory Based Information Technology (GAMBIT) Study – [165](#)

SYSTEMS ENGINEERING

Amateur Radio on the International Space Station - Phase 2 Hardware System – [61](#)

Design Rules for Life Support Systems – [137](#)

NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – [72](#)

Research Plan of the Operations Research Center and Department of Systems Engineering for Academic Year 2004 – [164](#)

SYSTEMS MANAGEMENT

Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – [205](#)

TACHYONS

Chiral Rings, Mirror Symmetry and the Fate of Localized Tachyons – [169](#)

TAPES

Flux-Pinning of Bi₂Sr₂CaCu₂O₈ + delta) High T_c Superconducting Tapes Utilizing (Sr,Ca)₁₄Cu₂₄O₄₁ + delta) and Sr₂CaAl₂O₆ Defects – [35](#)

TARGET ACQUISITION

Efficient Region Tracking and Target Position Estimation in Image Sequences using Kalman Filters – [69](#)

TARGET RECOGNITION

Synthetic Aperture Radar (SAR) Automatic Target Recognition (ATR) parametric Study – [68](#)

TARGETS

Coating and Mandrel Effects on Fabrication of Glow Discharge Polymer NIF Scale Indirect Drive Capsules – [177](#)

TAXONOMY

Expert Seeker: A People-Finder Knowledge Management System – [159](#)

Proposed Taxonomy of Software Weapons – [140](#)

TEARING

Discharge Improvement through Control of Neoclassical Tearing Modes by Localized ECCD in DIII-D – [192](#)

TECHNOLOGIES

Annual Report 2002 on Material Science and Technology – [27](#)

Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – [205](#)

TECHNOLOGY ASSESSMENT

An On-line Technology Information System (OTIS) for Advanced Life Support – [207](#)

ManTech Journal. Meeting the Challenge. Volume 10, Number 2, 1985 – [31](#)

Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles – [75](#)

TECHNOLOGY TRANSFER

Advanced Accelerator Technologies: A Snowmass '96 Subgroup Summary – [170](#)

TECHNOLOGY UTILIZATION

A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – [188](#)

- Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0004: Advanced Sol-Gel Adhesion Processes – 44
- Equivalent Mass versus Life Cycle Cost for Life Support Technology Selection – 136
- Fuel Cells for Space Science Applications – 79
- Investigation of the Erosion Characteristics of a Laboratory Hall Thruster – 22
- Software Surveyor – 148
- Spatial Information Technology Center at Fulton-Montgomery Community College – 201
- Ultra High Bypass Ratio Low Noise Engine Study – 12
- TELEMEDICINE**
- UH - USA Agreement - A Telemedicine Research Proposal – 110
- TELESCOPES**
- AstroNet: A Tool Set for Simultaneous, Multi-Site Observations of Astronomical Objects – 211
- Green Bank Telescope 290 to 395 MHz Feed Analysis and Modification for Operation in the 140 to 175 MHz Band – 60
- The Optical Telescope – 213
- TEMPERATURE DEPENDENCE**
- A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74
- Temperature Swing Adsorption Compressor Development – 74
- TEMPERATURE DISTRIBUTION**
- Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – 206
- TEMPERATURE EFFECTS**
- Advanced High Performance Solid Wall Blanket Concepts – 195
- Overview of Non-nuclear Testing of the Safe, Affordable 30-kW Fission Engine, Including End-to-End Demonstrator Testing – 22
- TEMPERATURE GRADIENTS**
- Mapping the Baby Universe – 228
- TEMPERATURE MEASUREMENT**
- Development of On-Line Temperature Measurement Instrumentation for Gasification Process Control. Semi-annual rept., 4/1/2000-9/31/2000 – 26
- Localized Flow Control in High Speed Flows Using Laser Energy Deposition – 5
- Measuring Temperature Reading – 94
- TEMPERATURE PROBES**
- Development of On-Line Temperature Measurement Instrumentation for Gasification Process Control. Semi-annual rept. ending 4/01/2001 – 27
- TEMPERATURE SCALES**
- Measuring Temperature Reading – 94
- TEMPORAL LOGIC**
- EAGLE can do Efficient LTL Monitoring – 158
- EAGLE Monitors by Collecting Facts and Generating Obligations – 148
- Execution-Based Model Checking of Interrupt-Based Systems – 157
- Rule-Based Runtime Verification – 158
- TENSORS**
- Plasma Dielectric Tensor for Non-Maxwellian Distributions in the FLR Limit – 182
- TERRAIN**
- Biogeochemical Cycles in Degraded Lands – 85
- Terrain Model Registration for Single Cycle Instrument Placement – 235
- TERRESTRIAL PLANETS**
- The Stability of Orbital Configurations and the Ultimate Configurations of Planetary and Satellite Systems – 215
- The Sun – 213
- TESTS**
- Effects of Markedly Increased Intravascular Pressure on the Volume-Flow Characteristics in Venous Vessels of Human Limbs – 1
- TETRACYCLINES**
- Novel Inhibitors of FGF Signal Transduction in Breast Cancer: Targeting the FGFR Adapter Protein SNT-1 – 109
- TEXTS**
- Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – 205
- THEMATIC MAPPING**
- Use of IKONOS Data for Mapping Cultural Resources of Stennis Space Center, Mississippi – 79
- THEOREM PROVING**
- Proceedings STRATA 2003. First International Workshop on Design and Application of Strategies/Tactics in Higher Order Logics; Focus on PVS experiences – 165
- THEORETICAL PHYSICS**
- Theoretical Problems in Accelerator Physics, Progress Report – 168
- THERAPY**
- Neoadjuvant Anti-Angiogenesis Therapy for Prostate Cancer – 127
- THERMAL CONDUCTIVITY**
- Thermal Conductivity and Stability of HfO₂-Y₂O₃ and La₂Zr₂O₇ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – 25
- Thermal Conductivity Evolution During Initial Stage Sintering – 28
- Thermal Effusivity as a Non-Destructive Method to Characterize Thin Films – 197
- Thermal Vacuum Testing of Swift XRT Ethane Heat Pipes – 65
- THERMAL CONTROL COATINGS**
- Thermal Conductivity and Stability of HfO₂-Y₂O₃ and La₂Zr₂O₇ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – 25
- THERMAL EXPANSION**
- High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures – 65
- Instrument for Measuring Cryo CTE – 47
- THERMAL PROTECTION**
- Development of Oxidation Protection Coatings for Gamma Titanium Aluminide Alloys – 43
- Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – 206
- THERMOCAPILLARY MIGRATION**
- High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 186
- THERMOCHEMISTRY**
- Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy – 35
- THERMODYNAMIC EFFICIENCY**
- Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – 70
- THERMODYNAMICS**
- Brane Gas Cosmology, M-Theory and Little String Theory – 234
- THERMOELECTRIC GENERATORS**
- Quarterly Technical Progress Report of Radioisotope Power System Materials Production and Technology Program Tasks for January through March 2000 – 61
- THERMOMETERS**
- A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74
- Measuring Temperature Reading – 94
- THERMOSPHERE**
- Ionosphere and Thermosphere: Ionospheric Irregularities – 89
- Ionospheric Irregularities – 93
- THIN FILMS**
- Growth Induced Magnetic Anisotropy in Crystalline and Amorphous Thin Films – 38
- Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25
- Thermal Effusivity as a Non-Destructive Method to Characterize Thin Films – 197
- THIN WINGS**
- Unsteady Aerodynamic Model for Thin Wings With Evolutive Vortex Sheets – 4

THOMSON SCATTERING

Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – 192

THREE DIMENSIONAL FLOW

Hydrotechnics in Situ Flow Sensor – 64

THREE DIMENSIONAL MODELS

Development of a Large-scale 3D MEMS Optical Switch Module – 187

Heat Transfer Modelling in Gas Turbine Stage – 13

Terrain Model Registration for Single Cycle Instrument Placement – 235

Transmission Line Model for Ground Magnetic Disturbances – 92

THRESHOLD DETECTORS (DOSIMETERS)

Cosmological Calculation Suggesting a Threshold for New Physics at 5 Tev – 223

THRUST CHAMBERS

Investigation of Impinging Stream Vortex Chamber Concepts for Liquid Rocket Engine Applications – 23

THRUST REVERSAL

Restricting the Use of Reverse Thrust as an Emissions Reduction Strategy (Revised) – 85

TIME DOMAIN ANALYSIS

Dynamic RCS: A Geometrical/Eulerian Approach to Computing High Frequency Radar Cross Sections – 165

TIME SIGNALS

Three-Gorge Reservoir: A 'Controlled Experiment' for Calibration/Validation of Time-Variable Gravity Signals Detected from Space – 210

TISSUES (BIOLOGY)

Prostate Carcinoma Detection Using Combined Ultrasound, Elasticity, and Tissue Strain-Hardening Imaging – 126

TITANIUM ALLOYS

A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – 42

Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42

Time-Resolved Photoelectron Spectroscopy of Oxidation on the Ti(0001) Surface – 33

TITANIUM ALUMINIDES

Development of Oxidation Protection Coatings for Gamma Titanium Aluminide Alloys – 43

TITAN

Electrical Charging of the Clouds of Titan – 211

Europa and Titan: Oceans in the Outer Solar System? – 209

TOKAMAK DEVICES

Achieving and Sustaining Steady-State Advanced Tokamak Conditions on DIII-D – 190

Advanced Tokamak Operation Using the DIII-D Plasma Control System – 193

Advanced Tokamak Profile Evolution in DIII-D – 194

Characteristics of the H-Mode Pedestal and Extrapolation to ITER – 191

Complete Suppression of the $m=2/n=1$ Neoclassical Tearing Mode using Electron Cyclotron Current Drive on DIII-D – 178

Demonstration in the DIII-D Tokamak of an Alternate Baseline Scenario for ITER and Other Burning Plasma Experiments – 190

Ece Radiometer Upgrade on the DIII-D Tokamak – 194

Experimental Characterization of Coherent, Radially-Sheared Zonal Flows in the DIII-D Tokamak – 63

General Atomics Fusion Theory Program Annual Report for Fiscal Year 2002 – 191

Maturing ECRF Technology for Plasma Control – 196

New Interpretation of Alpha-Particle-Driven Instabilities in Deuterium-Tritium Experiments on the Tokamak Fusion Test Reactor – 189

Physics and Control of ELMing H-Mode Negative Central Shear Advanced Tokamak Scenario Based on Experimental Profiles for ITER – 191

Stationary High-Performance Discharges in the DIII-D Tokamak – 190

Transport by Intermittency in the Boundary of the DIII-D Tokamak – 180

Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – 192

TOPOGRAPHY

For a Cup of Water on Mars: Gusev Crater – 230

ICESat's Laser Measurements of Polar Ice, Atmosphere, Ocean, and Land – 103

TOPOLOGY

Large-Scale Multi-Agent Distributed Mission Planning and Execution in Complex Dynamic Environments – 52

TOROIDAL PLASMAS

Resistive Wall Modes and Plasma Rotation in DIII-D – 192

TORPEDOES

Vortex Effects in the Dynamics of Underwater Weapons – 153

TORQUEMETERS

Dual Mode Inverter Control Test Verification – 57

TOUGHNESS

Heavy Section Steel Irradiation Program Monthly Letter Status Report for March 2001 – 41

TOXICITY

Genetic Influences on Toxicity and Prognosis in Women Treated With Breast-Conserving Surgery and Radiation Therapy – 118

Great Lakes Binational Toxics Strategy U.S. Challenge on Alkyl-lead: Report on Use of Alkyl-lead in Automotive Gasoline – 82

TOXICOLOGY

Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentaffluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37

TRACKING (POSITION)

Efficient Region Tracking and Target Position Estimation in Image Sequences using Kalman Filters – 69

Image Systems Using RFID Tag Positioning Information – 54

Spot Information Navigator – 55

TRAFFIC

Automated Data Collection, Analysis, and Archival – 204

TRAJECTORIES

Projectile Aerodynamic Jump Due to Lateral Impulses – 3

TRAJECTORY OPTIMIZATION

Optimum Climb to Cruise Noise Trajectories for the High Speed Civil Transport – 9

TRANSCRIPTION (GENETICS)

In Vivo Transcriptional Activation of Estrogen Receptor Target Genes: Differential Regulation in Mammary Gland Uterus and Bone – 118

The Prostate Expression Database (PEDB) – 106

TRANSIT TIME

ELM Particle and Energy Transport in the SOL and Divertor of DIII-D – 191

TRANSITION METALS

Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – 42

TRANSITION REGION AND CORONAL EXPLORER

RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – 241

TRANSMISSION LINES

Magnetosphere: Transmission Line Model for the Ground Magnetic Disturbances – 90

Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak – 192

TRANSMITTERS

Investigations of Low and Moderate Harmonic Fast Wave Physics on CDX-U – 182

TRANSONIC FLIGHT

Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – 64

Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – 62

TRANSONIC FLOW

Unsteady RANS Calculations for the GFSI Bump Preliminary Study Using EURANUS 5.3 – 1

TRANSONIC SPEED

Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – 6

TRANSPORT PROPERTIES

Simulation of Transport Phenomena in Aluminum Nitride Single-Crystal Growth – 196

Transport by Intermittency in the Boundary of the DIII-D Tokamak – 180

TRANSPORT THEORY

Large Aspect Ratio Limit of Neoclassical Transport Theory – 181

TRANSPORTATION ENERGY

Consumer Views on Transportation and Energy – 85

TRANSPORTATION NETWORKS

Air Transportation Network Routing and Scheduling – 9

TRANSPORTATION

Canister Transfer System Event Sequence Calculation – 202

Parallel Hybrid-Electric Sport Utility Vehicle-FutureTruck 2003 – 83

TRAPPED PARTICLES

Large Aspect Ratio Limit of Neoclassical Transport Theory – 181

TRAPPED VORTICES

Mixing and Combustion in Vortex Dominated Combustors with Distributed Air- and Fuel-Injection – 37

TRITIUM

New Interpretation of Alpha-Particle-Driven Instabilities in Deuterium-Tritium Experiments on the Tokamak Fusion Test Reactor – 189

TRMM SATELLITE

Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space – 98

Use of Collocated KWAJEX Satellite, Aircraft, and Ground Measurements for Understanding Ambiguities in TRMM Radiometer Rain Profile Algorithm – 96

TROPICAL REGIONS

Insights into Tropical Tropospheric Ozone from the SHADOZ Network – 102

TROPOSPHERE

Insights into Tropical Tropospheric Ozone from the SHADOZ Network – 102

TUBERCULOSIS

Tuberculosis Infection Among Young Adults Enlisting in the USA Navy – 130

TUMORS

Functional Analysis of Interactions Between 53BP1, BRCA1 and p53 – 105

Mechanism by which p66 Shc Suppresses Breast Cancer Tumorigenicity – 129

TUNABLE FILTERS

A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 55

A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188

TUNABLE LASERS

Solid State Research Quarterly Technical Report 2003:3 – 58

TUNGSTEN ALLOYS

Analysis of the Noneroding Penetration of Tungsten Alloy Long Rods into Aluminum Targets – 41

HVOF Application of Nickel and Nickel Alloy to Tungsten Heavy Alloy for Jacketed Penetrators – 40

TURBOFAN ENGINES

Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation – 159

Ultra High Bypass Ratio Low Noise Engine Study – 12

TURBULENCE

Multi-Grid Particle-in-cell Simulations of Plasma Microturbulence – 194

ULTRASONIC WELDING

ManTech Journal. Meeting the Challenge. Volume 10, Number 2, 1985 – 31

ULTRASONICS

Monitoring Cancer Oxygenation Changes Induced by Ultrasound – 122

Nondestructive Evaluation of a Metal Matrix Composite – 30

Prostate Carcinoma Detection Using Combined Ultrasound, Elasticity, and Tissue Strain-Hardening Imaging – 126

ULTRAVIOLET RADIATION

Working Toward a Healthy Planet – 135

UNDERWATER ACOUSTICS

San Clemente Island Undersea Range Acoustic Experiment, July 2002 – 185

UNDERWATER COMMUNICATION

Signal Processing for Acoustic Communications in Underwater Channels using Quadrature Amplitude Modulation – 50

UNDERWATER VEHICLES

Recursive Terrain Navigation. Application of the Correlation Method – 160

UNITED STATES

Prostate Cancer in Nigerians, Jamaicans and U.S. Blacks – 205

UNIVERSE

A Polarized Universe – 227

Measurement of Precision Geometric Distances to Three Anchor Points in the Local Universe – 67

Supernovae and the Accelerating Universe – 217

The Center of the Galaxy – 214

UNSTEADY AERODYNAMICS

Model of Unsteady Aerodynamic Coefficients of a Delta Wing Aircraft at High Angles of Attack – 6

Unsteady Aerodynamic Model for Thin Wings With Evolutive Vortex Sheets – 4

UNSTEADY FLOW

Unsteady Flows and Airfoil-Vortex Interaction – 6

UNSTRUCTURED GRIDS (MATHEMATICS)

Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – 62

UPPER ATMOSPHERE

Reversing Flows and Heat Spike: Caused by Solar g-Modes? – 76

URANIUM OXIDES

Neutronic Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997. Volume 4, Part 6-Esada Plutonium Program Critical Experiments: Power Distribution Measurements – 28

URANUS (PLANET)

Uranus, Neptune, and the Mountains of the Moon – 226

URBAN PLANNING

How to Prepare a Startup, Shutdown, Malfunction Plan for Collection and Control Systems at Municipal Solid Waste Landfills – 82

USER MANUALS (COMPUTER PROGRAMS)

TOSCA User-Guide – 150

UTERUS

In Vivo Transcriptional Activation of Estrogen Receptor Target Genes: Differential Regulation in Mammary Gland Uterus and Bone – 118

V-22 AIRCRAFT

Effects of Blade Sweep on V-22 Whirl Flutter and Loads – 10

VACCINES

Identification of Secondary Mutations Which Enhance and Stabilize the Attenuation of Brucella HTRA Mutants: Improving Brucella HTRS-Based Strains as Vaccine – 106

VACUUM

Thermal Vacuum Testing of Swift XRT Ethane Heat Pipes – 65

VECTOR PROCESSING (COMPUTERS)

A Performance Evaluation of the Cray X1 for Scientific Applications – 156

VEINS

Effects of Markedly Increased Intravascular Pressure on the Volume-Flow Characteristics in Venous Vessels of Human Limbs – 1

VELOCITY DISTRIBUTION

What are the Causes of the Formation of the Sub-Alfvenic Flows at the High Latitude Magnetopause – 18

VELOCITY

Automated Data Collection, Analysis, and Archival – 204

VERTICAL AIR CURRENTS

Regional Variability in Convection and Rain Retrievals from the TRMM Microwave Imager (TMI) – 101

VERTICAL DISTRIBUTION

NASA's Scientific Agenda for GPM Mission – 96

Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – 88

VIBRATION METERS

Preliminary Observations Regarding LDV Scans of Panels Excited by Broadband Actuators at the US Capitol – 72

VIBRATION TESTS

Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – 18

VIDEO COMMUNICATION

Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 155

Scalable Content Delivery Technology – 155

VIRTUAL REALITY

NASA Virtual Glovebox: An Immersive Virtual Desktop Environment for Training Astronauts in Life Science Experiments – 19

System Evaluation of Hardware and Software for a Streaming Multimedia Server Using the Multicasting Protocol – 149

VIRUSES

Development of a Viral Biological-Threat Bioinformatics Resource – 131

Marine Mammal Health: Development of Immunodiagnostic and Viral Diagnostic Methodologies and Reagents – 123

VISCOSITY

Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42

VOLCANIC ERUPTIONS

Explosive Volcanic Eruptions on the Moon – 227

Jupiter's Hot, Mushy Moon – 234

VOLCANOES

Big Mountain, Big Landslide on Jupiter's Moon, Io – 232

Meteorites from Mars, Rocks from Canada – 231

VORTEX BREAKDOWN

CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft – 3

VORTEX SHEDDING

Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control – 7

VORTEX SHEETS

Unsteady Aerodynamic Model for Thin Wings With Evolutive Vortex Sheets – 4

VORTICES

A New Vortex Flow Experiment for Computer Code Validation – 150

An Assessment of CFD Effectiveness for Vortex Flow Simulation to Meet Preliminary Design Needs – 8

An Experimental Investigation of Leading Edge Vortices and Passage to Stall of Nonslender Delta Wings – 4

Compressibility and Leading-Edge Bluntness Effects for a 65 Deg Delta Wing – 10

Design Issues Associated with Full-Scale Application of Active Control of Vortex Flows – 8

Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings – 8

Investigation of Impinging Stream Vortex Chamber Concepts for Liquid Rocket Engine Applications – 23

Marine Vortices and Their Computation – 64

Military Vortices – 4

Model of Unsteady Aerodynamic Coefficients of a Delta Wing Aircraft at High Angles of Attack – 6

Normal Shock Vortex Interaction – 7

Numerical Modelling of Vortex Flow Instabilities and Interactions – 8

PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – 3

Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – 66

Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure – 3

Technical Evaluation Report, Part A - Vortex Flow and High Angle of Attack – 5

Vortex Effects in the Dynamics of Underwater Weapons – 153

Vortex Flow Dilemmas and Control on Wing Planforms on High Speed – 4

WARNING SYSTEMS

A Publish/Subscribe Based Architecture of an Alert Server to Support Prioritized and Persistent Alerts – 143

WASTE TREATMENT

Canister Transfer System Event Sequence Calculation – 202

Technical Report and Testing Protocol for Commercial Microbiological Amendment Testing and Evaluation – 208

WATER FLOW

Hydrotechnics in Situ Flow Sensor – 64

WATER POLLUTION

Technical Report and Testing Protocol for Commercial Microbiological Amendment Testing and Evaluation – 208

WATER TUNNEL TESTS

Motion Effects on Leading-Edge Vortex Behavior over Delta Wings and Generalized Modeling – 7

WATER

Characterization of Soluble Organic in Produced Water – 35

Europa's Salty Surface – 226

For a Cup of Water on Mars: Gusev Crater – 230

Life on Mars? – 230

Tagging Water Sources in Atmospheric Models – 102

WAVE FUNCTIONS

Soft Gluons in the Finite Momentum Wave Function and the BFKL Pomeron – 175

WAVE GENERATION

End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – 80

WAVE INTERACTION

Finite-Duration Seeding Effects in Powerful Backward Raman Amplifiers – 183

WAVEFORMS

Apparatus and Method for Calibrating Voltage Spike Waveforms – 55

WAVELENGTH DIVISION MULTIPLEXING

Monolithically Integrated 64-channel WDM Channel Selector – 54

WAVELENGTHS

Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature – 186

WAVE-PARTICLE INTERACTIONS

Polar Plasma Wave Investigation Data Analysis in the Extended Mission – 218

WEAPONS

PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – 3

WEATHER FORECASTING

Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space – 98

Global Weather Prediction and High-End Computing at NASA – 101

Recent Observing System Simulation Experiments at the NASA DAO – 101

WEATHER

Space Weather: The Invisible Foe – 209

WEBSITES

BABAR: A Community Web Site in an Organizational Setting – 167

WIGGLER MAGNETS

Calculation of the Coherent Synchrotron Radiation Impedance from a Wiggler – 173

WIND (METEOROLOGY)

Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure – 3

WIND TUNNEL TESTS

Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – 6

Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control – 7

WIND TUNNEL WALLS

Technical Report of National Aerospace Laboratory: Transition Process of Boundary Layers on a Low-Speed Wind-Tunnel Contraction Wall – 2

WIND TURBINES

Demonstration of the Ability of RCAS to Model Wind Turbines – 2

Investigation of the IEC Safety Standard for Small Wind Turbine Design through Modeling and Testing – 2

WIND VELOCITY

Conjugate Auroral Imagery – 91

WING NACELLE CONFIGURATIONS

Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – 62

WING PLANFORMS

Vortex Flow Dilemmas and Control on Wing Planforms on High Speed – 4

WINGS

Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control – 7

Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – 64

WIRELESS COMMUNICATION

Connectivity and Reliability in Ad Hoc Networks – 50

WORKLOADS (PSYCHOPHYSIOLOGY)

A Scalability Model for ECS's Data Server – 144

Experimental Evaluation and Workload Characterization for High-Performance Computer Architectures – 139

Human Performance Effects of Adaptive Automation of Various Air Traffic Control Information Processing Functions – 9

X RAY ANALYSIS

Guidelines for the Application of SEM/EDX Analytical Techniques to Particulate Matter Samples – 68

X RAY APPARATUS

X-Ray Sources for the Triggering of Electromagnetic Pulses from Isomeric Materials – 185

X RAY ASTRONOMY

Baby Stars in Orion Solve Solar System Mystery – 214

Disentangling X-Ray Emission Processes in Vela-Like Pulsars – 223

How to Build a Supermassive Black Hole – 221

Journey to the Center of a Neutron Star – 222

X RAY DIFFRACTION

X-Ray Studies of Magnetic Nanoparticle Assemblies – 172

X RAY SOURCES

Disentangling X-Ray Emission Processes in Vela-Like Pulsars – 223

X-ray Haloes and Scattering by Interstellar Grains – 236

YIELD STRENGTH

Analysis of the Noneroding Penetration of Tungsten Alloy Long Rods into Aluminum Targets – 41

YTTRIUM OXIDES

Thermal Conductivity and Stability of HfO₂-Y₂O₃ and La₂Zr₂O₇ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – 25

ZARYA CONTROL MODULE

Amateur Radio on the International Space Station - Phase 2 Hardware System – 61

ZIRCONIUM ALLOYS

A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – 42

Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42

ZIRCONIUM COMPOUNDS

Thermal Conductivity and Stability of HfO₂-Y₂O₃ and La₂Zr₂O₇ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – 25

Personal Author Index

Abbott, Mark

Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – [104](#)

Abdurrahman, N. M.

Neutronic Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997. Volume 4, Part 6-Esada Plutonium Program Critical Experiments: Power Distribution Measurements – [28](#)

Abe, Hirofumi

Scalable Content Delivery Technology – [155](#)

Abeles, Joseph H.

Bistable Reflective Etalon (BRET) – [56](#)

ABmann, R.

Comparative Assessment of Simulation Tools for Beam Delivery Systems of Linear Colliders – [166](#)

Abumeri, Galib H.

Probabilistic Dynamic Buckling of Smart Composite Shells – [75](#)

Abumeri, Galib

Structural Evaluation of Exo-Skeletal Engine Fan Blades – [75](#)

Acharya, Anurag

EOSDIS Project on High-Performance I/O Techniques – [146](#)

Acharya, Sumaanta

Mixing and Combustion in Vortex Dominated Combustors with Distributed Air and Fuel-Injection – [37](#)

Ackerman, Steven A.

Global Multispectral Cloud Retrievals from MODIS – [69](#)

Acree, C. W., Jr.

Effects of Blade Sweep on V-22 Whirl Flutter and Loads – [10](#)

Adam, Nabil

Geodata Modeling and Query in Geographic Information Systems – [144](#)

Adami, P.

Heat Transfer Modelling in Gas Turbine Stage – [13](#)

Adams, J. H.

The EUSO Mission – [215](#)

Adams, R. B.

Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – [17](#)

Adesanya, A.

Verge of One Petabyte: The Story Behind the BaBar Database – [167](#)

Adler, Robert F.

Westerly Wind Events in the Eastern Indian Ocean as a Precursor to El Nino: A Case Study for the 2002-03 El Nino – [103](#)

Affleck, Dave L.

Temperature Swing Adsorption Compressor Development – [74](#)

Ahrens, James P.

A Visual Database System for Image Analysis on Parallel Computers and its Application to the EOS Amazon Project – [159](#)

Ahrony, O.

Duality and Other Exotic Gauge Dynamics in Softly Broken Supersymmetric QCD – [171](#)

Ahsan, Habibul

Association Between Offspring's hCG Genotype and Breast Cancer Risk in Mothers: A Novel Approach – [112](#)

Akeson, M.

Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – [32](#)

Akiba, Junya

Scalable Content Delivery Technology – [155](#)

Akkurt, H.

Neutronic Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997. Volume 4, Part 6-Esada Plutonium Program Critical Experiments: Power Distribution Measurements – [28](#)

Albery, William B.

Compilation of Technical Papers Published Under Work Unit 72312501 (71844501) 'Acceleration Performance in Advanced Operational Systems,' 1985-2000 – [205](#)

Albrecht, F.

Parallel Hybrid-Electric Sport Utility Vehicle-FutureTruck 2003 – [83](#)

Albrow, M.

Structure Function Subgroup Summary – [170](#)

Alexander, A.

Example Moisture Mass Balance Calculations for Bioreactor Landfills – [83](#)

Alexander, R. A.

Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – [17](#)

Alexander, S. H. S.

Brane Gas Cosmology, M-Theory and Little String Theory – [234](#)

Alexander, S.

Geometrization of Matter Proposal in the Barrett-Crane Model and Resolution of Cosmological Problems – [217](#)

Alivisatos, A. P.

Hybrid Nanorod-Polymer Solar Cell – [80](#)

Allen, C. A.

Parameter Comparison for Low-Noise MoAu TES Bolometers – [74](#)

Allton, J. H.

Genesis Discovery Mission: Science Canister Processing at JSC – [237](#)

Allwood, Shari J.

Tri-Services Workshop on Process Induced Defects in Wide Bandgap Semiconductors – [59](#)

Ambrosone, Christine B.

Genetic Influences on Toxicity and Prognosis in Women Treated With Breast-Conserving Surgery and Radiation Therapy – [118](#)

Ancarrow, Walter C.

Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – [20](#)

Anders, A.

S-Shaped Magnetic Macroparticle Filter for Cathodic ARC Deposition – [44](#)

Anders, S.

S-Shaped Magnetic Macroparticle Filter for Cathodic ARC Deposition – [44](#)

X-Ray Absorption and Diffraction Studies of Magnetic Nanoparticle Assemblies – [26](#)

X-Ray Studies of Magnetic Nanoparticle Assemblies – [172](#)

Andersen, K. H.

OSIRIS User Guide, 1st Edition – [173](#)

Anderson, Randy L.

An Analysis of Implementation Issues for the Searchable Content Object Reference Model (SCORM) in Navy Education and Training – [204](#)

Anderson, Robert A.

Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0004: Advanced Sol-Gel Adhesion Processes – [44](#)

Andersson, J.

Development of an Instrument for Measuring Team Performance Potential – [137](#)

Andrasik, Frank

The War Fighter's Stress Response: Telemetric and Noninvasive Assessment – [121](#)

- Andrews, Earl H., Jr.**
Exhaust Simulation Testing of a Hyper-sonic Airbreathing Model at Transonic Speeds – [13](#)
- Andrykowski, Michael A.**
Research Training in Biopsychosocial Breast Cancer Research – [122](#)
- Angier, Michael K.**
Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – [36](#)
- Anlauf, H.**
WOPPER, Version 1.1: A Monte Carlo Event Generator for Four Fermion Production at LEP-II and Beyond – [166](#)
- Arbegast, Daniel**
PAIRS, The GIS-Based Incident Response System for Pennsylvania, and NASA – [91](#)
- Archer, Myla M.**
Proceedings STRATA 2003. First International Workshop on Design and Application of Strategies/Tactics in Higher Order Logics; Focus on PVS experiences – [165](#)
- Ardizzone, Joseph**
Recent Observing System Simulation Experiments at the NASA DAO – [101](#)
- Arendt, Richard G.**
An Empirical Decomposition of Near-IR Emission into Galactic and Extragalactic Components – [216](#)
- Armstrong, Katrina A.**
Identifying and Reaching Populations at Risk: The Paradox of Breast Cancer Control – [113](#)
- Armstrong, T. A.**
Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – [200](#)
- Arnold, James R.**
Space Instruments: General Considerations – [20](#)
- Aro, M.**
Helsinki University of High Voltage Institute Annual Report 2002 – [56](#)
- Artho, Cyrille**
Applying Jlint to Space Exploration Software – [153](#)
- Atlas, Robert**
Global Weather Prediction and High-End Computing at NASA – [101](#)
Recent Observing System Simulation Experiments at the NASA DAO – [101](#)
- Atzman, M.**
Isolation of Microstructure in Proton-Irradiated Steels – [40](#)
- Au, Dyng**
Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – [30](#)
- Austin, M. E.**
Ece Radiometer Upgrade on the DIII-D Tokamak – [194](#)
- Auxier, Thomas A.**
The Importance of Cooling Technology in Propulsion and Power Systems – [13](#)
- Avanov, L. A.**
What are the Causes of the Formation of the Sub-Alfvénic Flows at the High Latitude Magnetopause – [18](#)
- Avanov, Levon**
End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – [80](#)
- Ayachitula, Rajani**
Holographic Optical Storage Using Photorefractive Polymers – [187](#)
- Ayers, C. W.**
Dual Mode Inverter Control Test Verification – [57](#)
- Ayguade, Eduard**
Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications – [157](#)
- Aylor, Stephen W.**
Compressed Air System Survey at Army Industrial Facilities – [66](#)
- Azmoon, T.**
Verge of One Petabyte: The Story Behind the BaBar Database – [167](#)
- Baggett, Randy**
SEP Mission to Titan NEXT Aerocapture In-Space Propulsion (Quicktime Movie) – [24](#)
- Baglin, J. E. E.**
Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – [39](#)
- Bailey, J. M.**
Dual Mode Inverter Control Test Verification – [57](#)
- Bailey, John**
Radiant Temperature Nulling Radiometer and Polarization Enhanced Thermal Radiometer – [67](#)
- Baker, Charles L.**
Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – [20](#)
- Bakes, E. L. O.**
Electrical Charging of the Clouds of Titan – [211](#)
- Balch, W.**
Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – [104](#)
- Ball, M.**
Experimental Measurement of Resonance Islands Induced by the RF Voltage Modulation – [175](#)
- Baltz, A.**
Muon Collier Design – [174](#)
- Bane, K.**
Model Independent Analysis of Beam Dynamics in Accelerators – [169](#)
- Banerjee, Prithviraj**
PACT: Power Aware Compilation and Architectural Techniques – [151](#)
- Bansal, Narottam P.**
Thermal Conductivity and Stability of HfO₂-Y₂O₃ and La₂Zr₂O₇ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – [25](#)
- Barclay, Rich**
A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – [188](#)
- Barlow, R. J.**
BaBar Web Job Submission with Globus Authentication and AFS Access – [154](#)
- Barnes, J. M.**
Neutronic Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997. Volume 4, Part 6-Esada Plutonium Program Critical Experiments: Power Distribution Measurements – [28](#)
- Barov, N.**
Summary Report of Working Group 4: Electron Beam Driven Concepts – [198](#)
- Barringer, Howard**
EAGLE can do Efficient LTL Monitoring – [158](#)
Rule-Based Runtime Verification – [158](#)
- Barringer, Howard**
EAGLE Monitors by Collecting Facts and Generating Obligations – [148](#)
- Barsky, Sanford H.**
The Role of Myoepithelial Maspin in Breast Carcinoma Progression Diagnosis and Screening – [120](#)
- Battiste, Vernol**
Enabling CSPA Operations Through Pilot Involvement in Longitudinal Approach Spacing – [14](#)
- Bauer, F.**
Amateur Radio on the International Space Station - Phase 2 Hardware System – [61](#)
- Baum, Andrew**
Center for Behavioral Research: Individual Interventions for Breast Cancer Patients – [124](#)
- Baum, Bryan A.**
Global Multispectral Cloud Retrievals from MODIS – [69](#)
- Bayer, Lisa**
Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – [128](#)
- Beal, M. F.**
Oxidative Damage in Parkinson's Disease – [120](#)

- Beamesderfer, Mike**
Field-effect Flow Control in Polymer Microchannel Networks – 61
- Beauchamp, James**
Mental Representation of Auditory Sources – 184
- Becerra-Fernandez, Irma**
Expert Seeker: A People-Finder Knowledge Management System – 159
- Becher, T.**
Self-Energy of Improved Staggered Quarks – 199
- Becia, J.**
Verge of One Petabyte: The Story Behind the BaBar Database – 167
- Beck, D. H.**
High Power Liquid Hydrogen Target for Parity Violation Experiments – 171
- Becker, K. J.**
Are the Energy Analysis (EA) and the Statistical Energy Analysis (SEA) compatible? – 164
- Bedrax-Weiss, Tania**
Scoping Planning Agents With Shared Models – 160
- Behrndt, K.**
STU Black Holes and String Triality – 220
- Beise, E. J.**
High Power Liquid Hydrogen Target for Parity Violation Experiments – 171
- Beitelman, Alfred D.**
Laboratory Evaluation of Moisture Cure Urethane Coatings – 28
- Belardini, E.**
Heat Transfer Modelling in Gas Turbine Stage – 13
- Bell, B.**
SLAC Design and Manufacturing Process of Sphere-Mounted Reflectors – 187
- Bell, James H.**
Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – 6
- Belytschko, Ted**
Failure Prediction of Underwater Structures - Subdomain Decomposition and Meshfree Methods – 169
- Benford, D. J.**
Parameter Comparison for Low-Noise MoAu TES Bolometers – 74
- Berger, Bradley J.**
The Genome of *Bacillus cereus* 14579: A Local Analysis – 119
- Berger, E. L.**
Structure Function Subgroup Summary – 170
- Berger, Marsha J.**
Cartesian and Adaptive Methods for Complex Geometries – 162
- Berggren, P.**
Development of an Instrument for Measuring Team Performance Potential – 137
Dynamic Measurement of the Operator for Future System Development – 11
- Berk, H. L.**
New Interpretation of Alpha-Particle-Driven Instabilities in Deuterium-Tritium Experiments on the Tokamak Fusion Test Reactor – 189
- Bern, Z.**
Two-Loop Helicity Amplitudes for Quark-Gluon Scattering in QCD and Gluino-Gluon Scattering in Supersymmetric Yang-Mills Theory – 197
- Bernkopf, Jan**
Polymer Light-Emitting Diode (PLED) Process Development – 57
- Berry, J. T.**
Effect of Applied Pressure During Feeding of Critical Cast Aluminum Alloy Components with Particular Reference to Fatigue Resistance – 40
- Berton, Jeffrey J.**
Optimum Climb to Cruise Noise Trajectories for the High Speed Civil Transport – 9
- Besenbruch, G. E.**
Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy – 35
- Bezaire, D.**
Performance and Economics of Catalytic Glow Plugs and Shields in Direct Injection Natural Gas Engines for the Next Generation Natural Gas Vehicle Program – 73
- Bhatia, Pardeep**
Study of RANKL Expression in Metastatic Breast Carcinoma – 116
- Bias, Ray**
An Assessment of the Potential for Increasing the Salvageability of Critical Combat Traumas Through First Responder Interventions – 132
- Bindschadler, Robert**
Glaciology in Antarctica – 100
Possible Stick-Slip Mechanism for Whilans Ice Stream – 92
- Binkowski, F.**
Application of the Models-3 Community Multi-Scale Air Quality (CMAQ) Model System to SOS/Nashville 1999 – 84
- Birch, Trevor J.**
An Experimental and Computational Study of the Aerodynamics of a Square Cross-Section Body at Supersonic Speeds – 160
- Bird, R. K.**
Development of Oxidation Protection Coatings for Gamma Titanium Aluminide Alloys – 43
- Biswas, Rupak**
A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – 156
A Performance Evaluation of the Cray X1 for Scientific Applications – 156
Task Assignment Heuristics for Parallel and Distributed CFD Applications – 65
- Blackketter, D.**
Parallel Hybrid-Electric Sport Utility Vehicle-FutureTruck 2003 – 83
- Blacklow, Stephen C.**
Drug Discovery for Breast Cancer by Mirror-Image Display – 105
- Blanchard, F. T.**
Guidelines for the Application of SEM/EDX Analytical Techniques to Particulate Matter Samples – 68
- Blandford, Robert R.**
A Plan of Development for Detection Systems for Seismic and Infrasound Arrays – 87
- Blohowiak, Kay Y.**
Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0004: Advanced Sol-Gel Adhesion Processes – 44
- Blom, A. F.**
Review of Aeronautical Fatigue Investigations in Sweden During the Period June 2001 to April 2003 – 10
- Blonski, Slawomir**
Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+ – 67
- Blood, Christopher G.**
An Assessment of the Potential for Increasing the Salvageability of Critical Combat Traumas Through First Responder Interventions – 132
- Boccippio, Dennis J.**
A Step Beyond Simple Keyword Searches: Services Enabled by a Full Content Digital Journal Archive – 206
- Boccippio, Dennis**
Objective Classification of Radar Profile Types, and Their Relationship to Lightning Occurrence – 52
- Boedo, J. A.**
ELM Particle and Energy Transport in the SOL and Divertor of DIII-D – 191
Transport by Intermittency in the Boundary of the DIII-D Tokamak – 180
- Bojkov, B. R.**
Validation of Envisat Ozone Data Products using Satellite and Ground Based Data – 96
- Bolton, T.**
Structure Function Subgroup Summary – 170

Booth-Kewley, Stephanie

Predictors of Navy Attrition. II. A Demonstration of Potential Usefulness for Screening – [111](#)

Borrill, Julian

A Performance Evaluation of the Cray X1 for Scientific Applications – [156](#)

Borucki, William J.

Electrical Charging of the Clouds of Titan – [211](#)

Bosilovich, M.

Tagging Water Sources in Atmospheric Models – [102](#)

Bosilovich, Michael

Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – [100](#)

Bostick, D. T.

Characterization of Soluble Organic in Produced Water – [35](#)

Boulanger, Richard

An On-line Technology Information System (OTIS) for Advanced Life Support – [207](#)

Bowden, G.

SLAC Design and Manufacturing Process of Sphere-Mounted Reflectors – [187](#)

Boy, J. P.

Three-Gorge Reservoir: A 'Controlled Experiment' for Calibration/Validation of Time-Variable Gravity Signals Detected from Space – [210](#)

Boyce, Mary C.

Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – [45](#)

Boyle, Richard

NASA Virtual Glovebox: An Immersive Virtual Desktop Environment for Training Astronauts in Life Science Experiments – [19](#)

Brabson, B.

Experimental Measurement of Resonance Islands Induced by the RF Voltage Modulation – [175](#)

Braby, L. A.

Development of Real-Time Measurement of Effective Dose for High Dose Rate Neutron Fields – [177](#)

Bradshaw, R. C.

Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – [42](#)

Brat, Guillaume

Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – [147](#)

Brennan, D. P.

Achieving and Sustaining Steady-State Advanced Tokamak Conditions on DIII-D – [190](#)

Bressler, Steven L.

Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – [162](#)

Briley, W. R.

Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – [66](#)

Brin, Eugenia

Recent Observing System Simulation Experiments at the NASA DAO – [101](#)

Brinckerhoff, Constance E.

Effect of a Single Nucleotide Polymorphism (NP) on Breast Cancer Invasion – [126](#)

Brittain, W. J.

Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – [45](#)

Brown, H. J.

Flux-Pinning of Bi₂Sr₂CaCu₂O₈ + δ High T_c Superconducting Tapes Utilizing (Sr,Ca)₁₄Cu₂₄O(41 + δ) and Sr₂CaAl₂O₆ Defects – [35](#)

Brown, I. G.

S-Shaped Magnetic Macroparticle Filter for Cathodic ARC Deposition – [44](#)

Brown, L. C.

Initial Screening of Thermochemical Water-Splitting Cycles for High Efficiency Generation of Hydrogen Fuels Using Nuclear Power – [32](#)

Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy – [35](#)

Brown, Otis

Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – [104](#)

Bruninga, B.

Amateur Radio on the International Space Station - Phase 2 Hardware System – [61](#)

Brunke, Lyle

Development of Nickel Alloy Substrates for Y-Ba-Cu-O Coated Conductor Applications – [38](#)

Bruyns, Cynthia

NASA Virtual Glovebox: An Immersive Virtual Desktop Environment for Training Astronauts in Life Science Experiments – [19](#)

Bucaro, J. A.

Preliminary Observations Regarding LDV Scans of Panels Excited by Broadband Actuators at the US Capitol – [72](#)

Budnick, J.

Experimental Measurement of Resonance Islands Induced by the RF Voltage Modulation – [175](#)

Bullard, Brad

Investigation of Impinging Stream Vortex Chamber Concepts for Liquid Rocket Engine Applications – [23](#)

Bungato, Dennis

Recent Observing System Simulation Experiments at the NASA DAO – [101](#)

Burgess, Lawrence P.

UH - USA Agreement - A Telemedicine Research Proposal – [110](#)

Burian, Steven J.

A Downscaling Analysis of the Urban Influence on Rainfall: TRMM Satellite Component AMS Conference on Satellite Meteorology and Oceanography – [98](#)

Burke, Kenneth A.

Fuel Cells for Space Science Applications – [79](#)

Burke, Thomas

Investigation of the Erosion Characteristics of a Laboratory Hall Thruster – [22](#)

Burkhardt, H.

Comparative Assessment of Simulation Tools for Beam Delivery Systems of Linear Colliders – [166](#)

Burnett, D. S.

Genesis Solar-Wind Sample Return Mission: The Materials – [237](#)

Burnett, Donald S.

The Genesis Solar Wind Sample Return Mission – [236](#)

Buron, Franck

Unsteady Aerodynamic Model for Thin Wings With Evolutive Vortex Sheets – [4](#)

Burrell, K. H.

Experimental Characterization of Coherent, Radially-Sheared Zonal Flows in the DIII-D Tokamak – [63](#)

Bylsma, Wesley

Spreadsheet Accumulator Sizing for Hybrid Hydraulic Applications Using the Benedict-Webb-Rubin Equation of State – [64](#)

Cabell, Randolph H.

Real-Time Adaptive Control of Flow-Induced Cavity Tones – [62](#)

Cahalan, Robert F.

SORCE and Future Satellite Observations of Solar Irradiance – [239](#)

Cai, Y.

Model Independent Analysis of Beam Dynamics in Accelerators – [169](#)

Caldwell, A.

Structure Function Subgroup Summary – [170](#)

Calero, Monica

Direct Effects of Folate Metabolism on Gene Expression in Metastatic Breast Cancer – [133](#)

Callenas, A.

Annual Report 2002 on Material Science and Technology – [27](#)

- Callis, R. W.**
Maturing ECRF Technology for Plasma Control – 196
Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak – 192
- Calomino, Anthony M.**
C/SiC Life Prediction for Propulsion Applications – 31
- Campbell, Janet**
Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104
- Canavan, E. R.**
A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74
- Canavan, Edgar R.**
Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – 70
- Canavan, Edgar**
A 10 Kelvin Magnet for Space-Flight ADRs – 210
- Candell, E.**
High Power Liquid Hydrogen Target for Parity Violation Experiments – 171
- Candler, Graham**
Localized Flow Control in High Speed Flows Using Laser Energy Deposition – 5
- Canfield, Dennis V.**
Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37
- Canning, Andrew**
A Performance Evaluation of the Cray X1 for Scientific Applications – 156
- Cao, Deliang**
P53 Regulation of Uridine Phosphorylase Activity, Pyrimidine Salvage Pathway and Their Effects on Breast Cancer Therapy – 109
- Cardelli, James A.**
Identification of Secondary Mutations Which Enhance and Stabilize the Attenuation of Brucella HTRA Mutants: Improving Brucella HTRS-Based Strains as Vaccine – 106
- Carder, Kendall**
Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104
- Cardona, Patrick S.**
Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37
- Carey, S. J.**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – 215
- Carlegrim, B.**
Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstrator – 51
- Carls, John**
System Evaluation of Hardware and Software for a Streaming Multimedia Server Using the Multicasting Protocol – 149
- Carlson, Edward J.**
An Assessment of the Potential for Increasing the Salvageability of Critical Combat Traumas Through First Responder Interventions – 132
- Carr, R.**
High Power Liquid Hydrogen Target for Parity Violation Experiments – 171
- Carroll, James J.**
X-Ray Sources for the Triggering of Electromagnetic Pulses from Isomeric Materials – 185
- Carter, Jonathan**
A Performance Evaluation of the Cray X1 for Scientific Applications – 156
- Cary, W. P.**
Maturing ECRF Technology for Plasma Control – 196
- Casper, T. A.**
Achieving and Sustaining Steady-State Advanced Tokamak Conditions on DIII-D – 190
- Cassell, Alan**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59
- Castillo, E. R.**
Coating and Mandrel Effects on Fabrication of Glow Discharge Polymer NIF Scale Indirect Drive Capsules – 177
Recent Progress in Fabrication of High-Strength Glow Discharge Polymer Shells by Optimization of Coating Parameters – 177
- Castor, M.**
Development of an Instrument for Measuring Team Performance Potential – 137
- Cattafesta, Louis N.**
Real-Time Adaptive Control of Flow-Induced Cavity Tones – 62
- Caussyn, D. D.**
Experimental Measurement of Resonance Islands Induced by the RF Voltage Modulation – 175
- Cawley, T.**
Instrumentation and Equipment Upgrades to Improve Acoustical and Fluid Dynamic Measurements in the Garfield Thomas Water Tunnel – 48
- Chakrabarti, Supriya**
AstroNet: A Tool Set for Simultaneous, Multi-Site Observations of Astronomical Objects – 211
- Chakravarthy, S.**
A Publish/Subscribe Based Architecture of an Alert Server to Support Prioritized and Persistent Alerts – 143
- Chamis, Christos C.**
Probabilistic Dynamic Buckling of Smart Composite Shells – 75
Structural Evaluation of Exo-Skeletal Engine Fan Blades – 75
- Chan, V. S.**
Interaction of Neutral Beam Injected Fast Ions with Ion Cyclotron Resonance Frequency Waves – 180
Large Aspect Ratio Limit of Neoclassical Transport Theory – 181
Physics and Control of ELMing H-Mode Negative Central Shear Advanced Tokamak Scenario Based on Experimental Profiles for ITER – 191
- Chandler, M. O.**
What are the Causes of the Formation of the Sub-Alfvenic Flows at the High Latitude Magnetopause – 18
- Chandler, Michael**
End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – 80
- Chao, Benjamin F.**
Three-Gorge Reservoir: A 'Controlled Experiment' for Calibration/Validation of Time-Variable Gravity Signals Detected from Space – 210
- Chao, Winston C.**
Factors Affecting the Latitudinal Location of the Intertropical Convergence Zone in a GCM – 91
- Chapman, J. M.**
Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17
- Charlton, Mark C.**
A Sounding Rocket Attitude Determination Algorithm Suitable for Implementation Using Low Cost Sensors – 161
- Chattopadhyay, S.**
Advanced Accelerator Technologies: A Snowmass '96 Subgroup Summary – 170
- Chaturvedi, Arvind K.**
Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37
- Cheek, Jack**
NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – 72

- Chen, Baode**
Factors Affecting the Latitudinal Location of the Intertropical Convergence Zone in a GCM – 91
- Chen, Bin**
Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
- Chen, Hua**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59
- Chen, Kong Y.**
Portable Physical Activity Monitors for Measuring Energy Metabolism in ROTC Cadets – 121
- Chen, P. C.**
Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – 64
- Cheng, C. Z.**
Flux Rope Acceleration and Enhanced Magnetic Reconnection Rate – 220
New Interpretation of Alpha-Particle-Driven Instabilities in Deuterium-Tritium Experiments on the Tokamak Fusion Test Reactor – 189
- Cherry, Gregory A.**
Quick Assessment of the Navy Mark V CBR Respirator After 13 Years in Storage – 137
- Chervenak, J. A.**
Parameter Comparison for Low-Noise MoAu TES Bolometers – 74
- Cheung, S. C. S.**
Initial Experiences with Retrieving Similar Objects in Simulation Data – 181
- Chiu, S. C.**
Interaction of Neutral Beam Injected Fast Ions with Ion Cyclotron Resonance Frequency Waves – 180
- Choe, G. S.**
Flux Rope Acceleration and Enhanced Magnetic Reconnection Rate – 220
- Choi, M.**
Interaction of Neutral Beam Injected Fast Ions with Ion Cyclotron Resonance Frequency Waves – 180
- Choudhary, Alok**
PACT: Power Aware Compilation and Architectural Techniques – 151
- Chu, M. S.**
Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – 195
Resistive Wall Modes and Plasma Rotation in DIII-D – 192
- Chu, S.**
Maturing ECRF Technology for Plasma Control – 196
- Chun, Robert**
An Expert System for the Development of Efficient Parallel Code – 152
- Cinke, Martin**
Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
- Ciszak, Ewa M.**
The Thiamin Pyrophosphate-Motif – 132
Use of Plastic Capillaries for Macromolecular Crystallization – 132
- Clark, A. James**
Understanding and Improving High-Performance I/O Subsystems – 145
- Clark, Ben**
The Genesis Solar Wind Sample Return Mission – 236
- Clark, Dennis**
Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104
- Clay, Christopher**
Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles – 75
- Clayton, LaNetra**
Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
- Coffey, Victoria**
End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – 80
- Cohen, M.**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – 215
- Cohen, R. E.**
Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – 45
- Cohen-Tanugi, J.**
Optical Properties of the DIRC Fused Silica Cherenkov Radiator – 181
- Colarco, P. R.**
Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – 85
- Colchin, R. J.**
ELM Particle and Energy Transport in the SOL and Divertor of DIII-D – 191
Transport by Intermittency in the Boundary of the DIII-D Tokamak – 180
- Colditz, Graham A.**
Training Grant in Epidemiology and Prevention of Breast Cancer – 114
- Cole, J.**
PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – 3
- Cole, Kevin J.**
Possible Life in a European Ocean – 138
- Collins, Nicholas R.**
Emission Line Galaxies in the STIS Parallel Survey – 217
- Collins, Ruth N.**
Direct Effects of Folate Metabolism on Gene Expression in Metastatic Breast Cancer – 133
- Colognesi, D.**
TOSCA User-Guide – 150
- Conner, T. L.**
Guidelines for the Application of SEM/EDX Analytical Techniques to Particulate Matter Samples – 68
- Conrad, Eric**
PAIRS, The GIS-Based Incident Response System for Pennsylvania, and NASA – 91
- Convery, M.**
Optical Properties of the DIRC Fused Silica Cherenkov Radiator – 181
- Cook, L. P.**
Flux-Pinning of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ High T_c Superconducting Tapes Utilizing $(\text{Sr,Ca})_{14}\text{Cu}_{24}\text{O}_{41+\delta}$ and $\text{Sr}_2\text{CaAl}_2\text{O}_6$ Defects – 35
- Cooper, Anita E.**
Support of Integrated Health Management (IHM) through Automated Analyses of Flowfield-Derived Spectrographic Data – 23
- Cooper, D. E.**
High Coverage Multicasting for Mobile Ad-hoc Networks – 51
- Cooper, Gene R.**
Projectile Aerodynamic Jump Due to Lateral Impulses – 3
- Cordey, J. G.**
Characteristics of the H-Mode Pedestal and Extrapolation to ITER – 191
- Cotrell, J.**
Demonstration of the Ability of RCAS to Model Wind Turbines – 2
- Cottrell, R. L.**
Overview of IEPME-BW Bandwidth Testing of Bulk Data Transfer – 49
- Courty, Jean-Claude**
CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft – 3
- Cowan, Kenneth H.**
Breast Cancer Training Program – 130
- Cowan, R.**
BABAR: A Community Web Site in an Organizational Setting – 167

- Crane, L.**
Geometrization of Matter Proposal in the Barrett-Crane Model and Resolution of Cosmological Problems – 217
- Crawford, James**
A Comparison of Techniques for Scheduling Fleets of Earth-Observing Satellites – 202
- Crescente, A.**
Distributed Offline Data Reconstruction in BABAR – 167
- Cruikshank, Dale**
Spectral Models of Kuiper Belt Objects and Centaurs – 216
- Curtis, Scott**
Westerly Wind Events in the Eastern Indian Ocean as a Precursor to El Nino: A Case Study for the 2002-03 El Nino – 103
- Cuzzi, Jeffrey N.**
Formation of Primitive Bodies in the Protoplanetary Nebula – 218
- Cyr, K. E.**
Genesis Discovery Mission: Science Canister Processing at JSC – 237
- Czechowicz, D. G.**
Recent Progress in Fabrication of High-Strength Glow Discharge Polymer Shells by Optimization of Coating Parameters – 177
- Czerny, B.**
Variability of Accretion Flow in the Core of the Seyfert Galaxy NGC 4151 – 218
- Dahlback, M.**
YMER User Guide – 51
- Dahmen, H. D.**
WOPPER, Version 1.1: A Monte Carlo Event Generator for Four Fermion Production at LEP-II and Beyond – 166
- Dalager, N. A.**
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
- Dalton, W. N., III**
Ultra High Bypass Ratio Low Noise Engine Study – 12
- D'Angelo, John**
Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
- Danielsson, B.**
Dynamic Measurement of the Operator for Future System Development – 11
- Dargush, A.**
Proceedings of the 2001 Earthquake Engineering Symposium for Young Researchers – 73
- Das, Sajal K.**
A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – 156
- Dateo, Christopher E.**
Dissociative Ionization and Product Distributions of Benzene and Pyridine by Electron Impact – 38
Simulation of Prebiotic Processing by Comet and Meteoroid Impact: Implications for Life on Early Earth and Other Planets – 236
- Daulton, Tyrone**
Presolar Grains of Star Dust: Astronomy Studied with Microscopes – 225
- Davidson, Eric A.**
Biogeochemical Cycles in Degraded Lands – 85
- Davidson, R. C.**
Comparison of Quantum Mechanical and Classical Trajectory Calculations of Cross Sections for Ion-Atom Impact Ionization of Negative- and Positive-Ions for Heavy Ion Fusion Applications – 193
- Davidson, R.**
Scaling of Cross Sections for Ion-Atom Impact Ionization – 35
- Davis, D.**
Investigation of the IEC Safety Standard for Small Wind Turbine Design through Modeling and Testing – 2
- de Almeida, V. F.**
Simulation of Transport Phenomena in Aluminum Nitride Single-Crystal Growth – 196
- De Freitas, A.**
Two-Loop Helicity Amplitudes for Quark-Gluon Scattering in QCD and Gluino-Gluon Scattering in Supersymmetric Yang-Mills Theory – 197
- De Rosset, William S.**
Nondestructive Evaluation of a Metal Matrix Composite – 30
- de Souza, E.**
Simulation-Based Study of High Speed TCP and its Deployment – 141
- Deamer, D.**
Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – 32
- DeanedeAbreuSa, Tatiana**
Biogeochemical Cycles in Degraded Lands – 85
- Deans, Matthew**
Terrain Model Registration for Single Cycle Instrument Placement – 235
- Dearden, Richard**
Hybrid Discrete-Continuous Markov Decision Processes – 141
Scheduling in the Face of Uncertain Resource Consumption and Utility – 202
- DeBoo, J. C.**
Advanced Tokamak Profile Evolution in DIII-D – 194
- Degnan, John J.**
NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – 72
- DeGuzman, V.**
Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – 32
- DeHaven, Stanton L.**
Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature – 186
- Delcuze, Tim**
Engine Blowdown Device – 73
- Delmau, L. H.**
Caustic-Side Solvent Extraction: Anti-Caking Surfactants Found to be Cause of Apparent Effect of High Nitrite Concentration on Cesium Stripping – 28
- Dempsey, Dave**
Development of Nickel Alloy Substrates for Y-Ba-Cu-O Coated Conductor Applications – 38
- Deng, S.**
Aspects of the Mechanical Behavior of Stitched T300 Mat/Urethane 420 IMR Composite – 30
- Dennis, Brian R.**
RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – 241
- Dennis, R.**
Application of the Models-3 Community Multi-Scale Air Quality (CMAQ) Model System to SOS/Nashville 1999 – 84
- Deshpande, Y.**
BABAR: A Community Web Site in an Organizational Setting – 167
- deSouzaMoutinho, Paulo R.**
Biogeochemical Cycles in Degraded Lands – 85
- Despit, Gregory**
High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures – 65
- Devinant, Philippe**
Unsteady Aerodynamic Model for Thin Wings With Evolutive Vortex Sheets – 4
- DeVoe, Don L.**
Field-effect Flow Control in Polymer Microchannel Networks – 61
- Dickinson, M. R.**
S-Shaped Magnetic Macroparticle Filter for Cathodic ARC Deposition – 44
- Ding, Ming-Zhou**
Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – 162
- Dipirro, M. J.**
A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74

- DiPirro, Michael J.**
Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – [70](#)
- DiPirro, Michael**
A 10 Kelvin Magnet for Space-Flight ADRs – [210](#)
- DiStefano, J. R.**
Screening Test Results of Fatigue Properties of Type 316LN Stainless Steel in Mercury – [41](#)
- DiVito, Ben L.**
Proceedings STRATA 2003. First International Workshop on Design and Application of Strategies/Tactics in Higher Order Logics; Focus on PVS experiences – [165](#)
- Dixon, L.**
Two-Loop Helicity Amplitudes for Quark-Gluon Scattering in QCD and Gluino-Gluon Scattering in Supersymmetric Yang-Mills Theory – [197](#)
- Djomehri, M. Jahed**
A Performance Evaluation of the Cray X1 for Scientific Applications – [156](#)

Task Assignment Heuristics for Parallel and Distributed CFD Applications – [65](#)
- Doane, J. L.**
Maturing ECRF Technology for Plasma Control – [196](#)
- Doddridge, B. G.**
Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – [85](#)
- Dominiak, Paulina M.**
The Thiamin Pyrophosphate-Motif – [132](#)
- Dongarra, J.**
High Performance Computing Clusters, Constellations, MPPs, and Future Directions – [140](#)
- Donovan, Howard**
NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – [72](#)
- Dorband, John**
Commodity Cluster Computing for Remote Sensing Applications using Red Hat LINUX – [143](#)
- Dorf, L.**
Diagnostic Setup for Characterization of Near-Anode Processes in Hall Thrusters – [12](#)

Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster – [189](#)
- Dorigo, A.**
Distributed Offline Data Reconstruction in BABAR – [167](#)
- Doroshenko, V. T.**
Variability of Accretion Flow in the Core of the Seyfert Galaxy NGC 4151 – [218](#)
- Dotson, Renee**
Space Science Reference Guide, 2nd Edition – [225](#)
- Dowell, Earl H.**
Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – [64](#)
- Drake, J. B.**
Vorticity-Divergence Global Semi-Lagrangian Spectral Model for the Shallow Water Equations – [95](#)
- Drilling, Holly S.**
Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – [36](#)
- Drusinsky, Doron**
Execution-Based Model Checking of Interrupt-Based Systems – [157](#)
- Drzaic, Paul**
Polymer Light-Emitting Diode (PLED) Process Development – [57](#)
- Dumont, R. J.**
Investigations of Low and Moderate Harmonic Fast Wave Physics on CDX-U – [182](#)

Plasma Dielectric Tensor for Non-Maxwellian Distributions in the FLR Limit – [182](#)
- Dunaevsky, A.**
Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster – [189](#)
- Duncan, F.**
High Power Liquid Hydrogen Target for Parity Violation Experiments – [171](#)
- Duncan, Martin J.**
The Stability of Orbital Configurations and the Ultimate Configurations of Planetary and Satellite Systems – [215](#)
- Dupont, J. N.**
Fe-Al Weld Overlay and High-Velocity Oxy-Fuel Thermal Spray Coatings for Corrosion Protection of Waterwalls in Fossil Fired Plants with Low NOx Burners – [34](#)
- Dutchyshyn, H.**
Single Integrated Air Picture (SIAP) Attributes – [150](#)
- Dutt, Nikil**
COPPER: Compiler-Controlled On-Demand Approach to Power-Efficient Computing – [149](#)
- Dwek, Eliahu**
X-ray Haloes and Scattering by Interstellar Grains – [236](#)
- Dwek, Eli**
An Empirical Decomposition of Near-IR Emission into Galactic and Extragalactic Components – [216](#)
- Ebbini, Emad S.**
Image-Guided Surgery of Primary Breast Cancer Using Ultrasound Phased Arrays – [110](#)
- Eberhart, Henry J.**
Science and Technology Text Mining: Hypersonic and Supersonic Flow – [203](#)
- Egan, M. P.**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – [215](#)
- Eichenberg, Dennis J.**
Baseline Testing of the Club Car Carryall With Asymmetric Ultracapacitors – [53](#)
- Eiderfors, B.**
Ageing Control Number 3 of Propellants for Rocket Motors RB 75 Maverick – [46](#)
- Eiken, O.**
Effects of Markedly Increased Intravascular Pressure on the Volume-Flow Characteristics in Venous Vessels of Human Limbs – [1](#)

Measurements on Spatial Disorientation during Gondola Centrifugation – [136](#)
- Ellis, J.**
Asymptotic Pade Approximant Predictions: up to Five Loops in QCD and SQCD – [174](#)
- El-Ghazawi, Tarek A.**
Experimental Evaluation and Workload Characterization for High-Performance Computer Architectures – [139](#)

Understanding and Improving High-Performance I/O Subsystems – [145](#)
- Eliopoulos, Nicoletta**
Genetically Engineered Autologous Cells for Antiangiogenic Therapy of Breast Cancer – [119](#)
- El-Khadra, A.**
Structure Function Subgroup Summary – [170](#)
- Elliott, Greg**
Localized Flow Control in High Speed Flows Using Laser Energy Deposition – [5](#)
- Ellis, R. A.**
Maturing ECRF Technology for Plasma Control – [196](#)
- Emberley, Ethan D.**
The Role of S100A7/RANBPM Interaction in Human Breast Cancer – [117](#)
- Emelianov, Stanislav Y.**
Prostate Carcinoma Detection Using Combined Ultrasound, Elasticity, and Tissue Strain-Hardening Imaging – [126](#)
- Emmitt, G. David**
Recent Observing System Simulation Experiments at the NASA DAO – [101](#)
- Engelke, C. W.**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – [215](#)

- Epner, Daniel E.**
Dietary Methionine Restriction: Novel Treatment for Hormone Independent Prostate Cancer – 111
- Erickson, Edwin F.**
SOFIA First Generation Science Instruments – 68
- Erickson, Gary E.**
Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – 6
- Erickson, R.**
Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstration – 51
- Esenaliev, Rinat O.**
Novel Drug Delivery Technique for Breast Cancer Therapy – 115
- Essias, Wayne E.**
Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104
- Evans, B.**
Cold-Start and Warm-Up Driveability Performance of Hybrid Electric Vehicles Using Oxygenated Fuels: Piggyback Project to the Volatility Group Intermediate -Temperature Program (CM-138-02) – 23
- Evans, Robert**
Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104
- Evans, T. E.**
Physics and Control of ELMing H-Mode Negative Central Shear Advanced Tokamak Scenario Based on Experimental Profiles for ITER – 191
- Ezhilchelvan, P.**
High Coverage Multicasting for Mobile Ad-hoc Networks – 51
- Fabinger, M.**
Stringy Resolutions of Null Singularities – 179
- Faeldt, D.**
Improved Infrared Object Signature Calculations for SensorVision (Trade Mark) by the Use of RadTherm (Trade Mark) – 188
- Fairbanks, C. J.**
Heavy Section Steel Irradiation Program Monthly Letter Status Report for March 2001 – 41
- Falconer, David**
Coronal Heating, Spicules, and Solar-B – 238
- Fanjoy, J.**
How to Prepare a Startup, Shutdown, Malfunction Plan for Collection and Control Systems at Municipal Solid Waste Landfills – 82
- Farrow, R. F. C.**
X-Ray Absorption and Diffraction Studies of Magnetic Nanoparticle Assemblies – 26
- Farrow, Raymond L.**
ManTech Journal. Guidelines for Defense Contractors. Volume 8/Number 2 – 9
- Farzan, Y.**
Effective Mass of the Electron Neutrino in Beta Decay – 185
- Fedorov, A.**
PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – 3
- Felling, Ryan J.**
Quick Assessment of the Navy Mark V CBR Respirator After 13 Years in Storage – 137
- Feng, Y. X.**
Probing the Inflow/Outflow and Accretion Disk of Cygnus X-1 in the High State with the Chandra High Energy Transmission Grating – 216
- Feng, Zhengzhu**
Hybrid Discrete-Continuous Markov Decision Processes – 141
- Fenn, Alan J.**
Green Bank Telescope 290 to 395 MHz Feed Analysis and Modification for Operation in the 140 to 175 MHz Band – 60
- Fenstermacher, M. E.**
ELM Particle and Energy Transport in the SOL and Divertor of DIII-D – 191
Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – 192
- Ferron, J. R.**
Achieving and Sustaining Steady-State Advanced Tokamak Conditions on DIII-D – 190
Advanced Tokamak Operation Using the DIII-D Plasma Control System – 193
Demonstration in the DIII-D Tokamak of an Alternate Baseline Scenario for ITER and Other Burning Plasma Experiments – 190
Stationary High-Performance Discharges in the DIII-D Tokamak – 190
- Figueiredo, Ricardo O.**
Biogeochemical Cycles in Degraded Lands – 85
- Fincher, S. S.**
Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17
- Fink, Yoel**
Design and Simulation of Transmission Properties of Hollow Bragg Fibers Fabricated from Omnidirectionally Reflective Composite Dielectric Materials – 58
- Finley, D. B.**
An Assessment of CFD Effectiveness for Vortex Flow Simulation to Meet Preliminary Design Needs – 8
- Finn, John E.**
Temperature Swing Adsorption Compressor Development – 74
- Fiorino, Steven**
Use of Collocated KWAJEX Satellite, Aircraft, and Ground Measurements for Understanding Ambiguities in TRMM Radiometer Rain Profile Algorithm – 96
- Fisch, N. J.**
Diagnostic Setup for Characterization of Near-Anode Processes in Hall Thrusters – 12
Electrostatic Probe with Shielded Probe Insulator Tube for Low Disturbing Plasma Measurements in Hall Thrusters – 195
Finite-Duration Seeding Effects in Powerful Backward Raman Amplifiers – 183
Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster – 189
- Fisher, John W.**
Investigating the Partitioning of Inorganic Elements Consumed by Humans between the Various Fractions of Human Wastes: An Alternative Approach – 33
- Flanagan, Louise A.**
Molecular Mechanisms of Metastatic Progression in Breast Cancer – 111
- Flater, David**
Performance Analysis of the Unitree Central File – 146
- Fleszar, Mark F.**
Thermal Effusivity as a Non-Destructive Method to Characterize Thin Films – 197
- Fletcher, Graham D.**
Dissociative Ionization and Product Distributions of Benzene and Pyridine by Electron Impact – 38
- Flinton, Michael E.**
Spatial Information Technology Center at Fulton-Montgomery Community College – 201
- Flueckiger, Lorenzo**
Mission Simulation Facility: Simulation Support for Autonomy Development – 160
- Flynn, L.**
Validation of Envisat Ozone Data Products using Satellite and Ground Based Data – 96
- Fok, Mei-Ching**
Stormtime Particle Energization with AMIE Potentials – 88
- Folkner, W.**
ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – 19

- Fonck, R. J.**
Experimental Characterization of Coherent, Radially-Sheared Zonal Flows in the DIII-D Tokamak – 63
- Fontaine, A. A.**
Instrumentation and Equipment Upgrades to Improve Acoustical and Fluid Dynamic Measurements in the Garfield Thomas Water Tunnel – 48
- Forsyth, T.**
Investigation of the IEC Safety Standard for Small Wind Turbine Design through Modeling and Testing – 2
- Forti, A.**
BaBar Web Job Submission with Globus Authentication and AFS Access – 154
- Frailis, M.**
Use of HepRep in GLAST – 218
- Frank, Jeremy D.**
Scoping Planning Agents With Shared Models – 160
- Frank, Jeremy**
Observations on SOFIA Observation Scheduling: Search and Inference in the Face of Discrete and Continuous Constraints – 202
Scheduling in the Face of Uncertain Resource Consumption and Utility – 202
- Franz, D. E.**
A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74
- Freeman, John W., Jr.**
Space Weather: The Invisible Foe – 209
- Freeman, Vincent L.**
Prostate Cancer in Nigerians, Jamaicans and U.S. Blacks – 205
- Fretter, E. F.**
Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – 206
- Frieder, Gideon**
Understanding and Improving High-Performance I/O Subsystems – 145
- Friedman, Rachel C.**
Meteorites from Mars, Rocks from Canada – 231
- Frink, N. T.**
Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – 62
- Fuchs, Elaine**
Role of E-Cadherin Homophilic Contacts in the Inhibition of Cell Growth of Primary Breast Cells – 129
- Fuhman, Christopher**
Optimizing IV and V for Mature Organizations – 153
- Fukuda, Kenichi**
NTT Technical Review – 53
- Funk, J. F.**
Initial Screening of Thermochemical Water-Splitting Cycles for High Efficiency Generation of Hydrogen Fuels Using Nuclear Power – 32
- Fuss, B.**
SLAC Design and Manufacturing Process of Sphere-Mounted Reflectors – 187
- Gackstetter, G. D.**
Are Gulf War Veterans Experiencing Illness Due to Exposure to Smoke from Kuwaiti Oil Well Fires? Examination of Department of Defense Hospitalization Data – 131
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
- Gaensler, Bryan**
Disentangling X-Ray Emission Processes in Vela-Like Pulsars – 223
- Galeazzi, F.**
Distributed Offline Data Reconstruction in BABAR – 167
- Galipeau, Jacques**
Genetically Engineered Autologous Cells for Antiangiogenic Therapy of Breast Cancer – 119
- Gallagher, Peter T.**
RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – 241
- Gallegos, SOnia C.**
About Nonlinear Dependence of Remote Sensing and Diffuse Reflection Coefficients on Gordon's Parameter – 78
- Gangopadhyay, A. K.**
A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – 42
Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – 42
Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42
- Ganji, Ahmad R.**
Compressed Air System Survey at Sierra Army Depot, CA – 81
- Ganz, Patricia A.**
Impact of Breast Cancer Treatments on Gonadal Function and Reproduction Health – 125
- Gao, Y. T.**
Maximum Acceptance Detector for the Fermilab Collider (MAX) – 200
- Garcia, Esther O.**
Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – 205
- Garcia, J.**
Intercomparison of Numerical Simulation Codes for Geologic Disposal of CO₂ – 84
- Gardner, Jonathan P.**
Emission Line Galaxies in the STIS Parallel Survey – 217
- Garofalo, A. M.**
Advanced Tokamak Operation Using the DIII-D Plasma Control System – 193
Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – 195
Resistive Wall Modes and Plasma Rotation in DIII-D – 192
- Gary, G. Allen**
Eruption of a Multiple-Turn Helical Magnetic Flux Tube in a Large Flare: Evidence for External and Internal Reconnection that Fits the Breakout Model of Solar Magnetic Eruptions – 238
- Gavalas, G. R.**
Ceramic Membranes for Hydrogen Production from Coal – 44
- Gaver, Donald P., Jr.**
Modeling and Analysis of Uncertain Time-Critical Tasking Problems (UTCTP) – 164
- Gazis, Paul**
Essential Autonomous Science Inference on Rovers (EASIR) – 235
- Geo, Xiaowei**
Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – 64
- George, Nicholas**
Electronic Imaging: Propagation, Retrieval, Recognition – 70
- German, Randall M.**
Thermal Conductivity Evolution During Initial Stage Sintering – 28
- Ghaffari, F.**
An Assessment of CFD Effectiveness for Vortex Flow Simulation to Meet Preliminary Design Needs – 8
- Ghee, Terence A.**
Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control – 7
- Ghosh-Choudhury, Nandini**
Mechanisms for Controlling Breast Cancer Growth and Skeletal Metastasis – 116
- Giampapa, Joseph**
Effective Coordination of Multiple Intelligent Agents for Command and Control – 158
- Giannakopoulou, Dimitra**
Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147
- Giannitrapani, R.**
Use of HepRep in GLAST – 218

- Giardino, Marco**
Use of IKONOS Data for Mapping Cultural Resources of Stennis Space Center, Mississippi – 79
- Gilland, James H.**
Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – 189
- Gimenez, Judit**
An Expert System for the Development of Efficient Parallel Code – 152
- Glasser, Gerald**
Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+ – 67
- Glazer, Robert I.**
The Role of AKT1 in Mammary Tumorigenesis and Transformation – 128
- Gleason, K.**
Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – 45
- Globus, Al**
A Comparison of Techniques for Scheduling Fleets of Earth-Observing Satellites – 202
- Godfrey, R. D.**
Heavy Section Steel Irradiation Program Monthly Letter Status Report for March 2001 – 41
- Godowitch, J.**
Application of the Models-3 Community Multi-Scale Air Quality (CMAQ) Model System to SOS/Nashville 1999 – 84
- Goh, Takashi**
Recent Advances in Optical Switches Using Silica-based PLC Technology – 50
- Goldberg, Allen**
EAGLE can do Efficient LTL Monitoring – 158
EAGLE Monitors by Collecting Facts and Generating Obligations – 148
Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147
Rule-Based Runtime Verification – 158
- Goldberg, Benjamin**
ASC3: Algorithmic Strategies for Compiler Controlled Caches – 151
- Golden, Keith**
Automated Data Processing as an AI Planning Problem – 69
- Goldhaber, A. S.**
Elementary Aharonov-Bohm System in Three Space Dimensions: Quantum Attraction with no Classical Force – 199
- Gonzalez, Hugo A.**
Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – 6
- Gonzalez, Marc**
Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications – 157
- Gonzalez, Rene I.**
The Specific Refractive Index Increment for Isobutyl P-SS-Polystyrene Copolymers – 37
- Goodman, D. W.**
Toward an Understanding of Catalysis by Supported Metal Nanoclusters – 27
- Goodman, J.**
Circulation in a Short Cylindrical Couette System – 66
- Goodnight, Thomas W.**
Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – 18
- Gorelenkov, N. N.**
New Interpretation of Alpha-Particle-Driven Instabilities in Deuterium-Tritium Experiments on the Tokamak Fusion Test Reactor – 189
- Gorelov, Y. A.**
Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak – 192
- Gorski, Joseph J.**
Marine Vortices and Their Computation – 64
- Gossweiler, Rich**
NASA's MERBoard: An Interactive Collaborative Workspace Platform – 235
- Gostowski, Rudy**
Isothermal Microcalorimetric Evaluation of Compatibility of Proposed Injector Materials with High-Test Hydrogen Peroxide Propellant – 46
- Gould, P.**
Proceedings of the 2001 Earthquake Engineering Symposium for Young Researchers – 73
- Granado, Joseph L.**
An Analysis of Implementation Issues for the Searchable Content Object Reference Model (SCORM) in Navy Education and Training – 204
- Granat, L.**
Precipitation Chemistry Studies in India: A Search for Regional Patterns – 100
- Gray, G. C.**
Are Gulf War Veterans Experiencing Illness Due to Exposure to Smoke from Kuwaiti Oil Well Fires? Examination of Department of Defense Hospitalization Data – 131
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
Tuberculosis Infection Among Young Adults Enlisting in the USA Navy – 130
- Green, Lawrence L.**
Computational Methods for Dynamic Stability and Control Derivatives – 14
- Greenfield, C. M.**
Advanced Tokamak Profile Evolution in DIII-D – 194
- Greenhouse, Matt**
A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188
- Greer, Lawrence C.**
Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation – 159
- Gregorek, Gerald**
Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – 189
- Grob, Eric W.**
Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – 20
- Groebner, R. J.**
Characteristics of the H-Mode Pedestal and Extrapolation to ITER – 191
Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – 192
- Gross, Michael**
Observations on SOFIA Observation Scheduling: Search and Inference in the Face of Discrete and Continuous Constraints – 202
- Groth, M.**
Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – 192
- Gu, Guojun**
Westerly Wind Events in the Eastern Indian Ocean as a Precursor to El Nino: A Case Study for the 2002-03 El Nino – 103
- Gugliotti, G. M.**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – 215
- Gundmark, T.**
Annual Report 2002 on FOI's Research on Command, Control, Communication and Information Technology (C31) – 51
- Gunnarsson, R.**
Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstrator – 51
- Guo, D. X.**
Vorticity-Divergence Global Semi-Lagrangian Spectral Model for the Shallow Water Equations – 95
- Gupta, Rajesh**
COPPER: Compiler-Controlled On-Demand Approach to Power-Efficient Computing – 149

- Gurnett, Donald A.**
Polar Plasma Wave Investigation Data Analysis in the Extended Mission – 218
- Guruswamy, Guru**
A New Modular Approach for Tightly Coupled Fluid/Structure Analysis – 63
- Gust, D.**
Supramolecular Structures for Photochemical Energy Conversion – 80
- Gustafsson, A.**
FOI/FFA 2002 Research on Missiles, Stealth Technology and UAVs, Complementary FMV 250180-LB604516 – 66
- Guy, Yair**
Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings – 8
- Haas, Patrick E.**
Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation – 29
- Haber, H. E.**
Weakly-Coupled Higgs Bosons and Precision Electroweak Physics – 170
- Hackett, Bryan**
Compressed Air System Survey at Sierra Army Depot, CA – 81
- Hadaway, James B.**
Instrument for Measuring Cryo CTE – 47
- Haddad, Timothy S.**
The Specific Refractive Index Increment for Isobutyl Poly-Styrene Copolymers – 37
- Hadig, T.**
DIRC for a Higher Luminosity B Factory – 198
- Haenninen, J. J.**
Electrostatic Image Theory for the Anisotropic Boundary – 172
- Hahn, Joe**
The Kuiper Belt and Oort Cloud – 228
- Halbig, Michael C.**
C/SiC Life Prediction for Propulsion Applications – 31
- Hall, Charles E.**
Advanced Guidance and Control for Hypersonics and Space Access – 16
- Hall, Doug R.**
Experimental and Numerical Investigation of Vortex Shedding of a Representative UCAV Configuration for Vortex Flow Control – 7
- Hall, John A.**
E-3 In-Flight Acoustic Exposure Studies and Mitigation Via Active Noise Reduction Headset – 11
- Hall, Kenneth C.**
Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – 64
- Hallatschek, K.**
Experimental Characterization of Coherent, Radially-Sheared Zonal Flows in the DIII-D Tokamak – 63
- Haltrin, Vladimir I.**
About Nonlinear Dependence of Remote Sensing and Diffuse Reflection Coefficients on Gordon's Parameter – 78
- Halyo, E.**
Braneless Black Holes – 174
- Counting Schwarzschild and Charged Black Holes – 220
- Hamilton, C. J.**
Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy – 35
- Han, Jie**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59
- Han, T.**
Weakly-Coupled Higgs Bosons and Precision Electroweak Physics – 170
- Hanano, Shinya**
Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 155
- Hanff, E. S.**
Motion Effects on Leading-Edge Vortex Behavior over Delta Wings and Generalized Modeling – 7
- Hanson, B.**
Analysis of Radial Segregation in Directionally Solidified Hg(0.89)Mn(0.11)Te – 43
- Hanson, J.**
ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – 19
- Hanson, John M.**
Advanced Guidance and Control for Hypersonics and Space Access – 16
- Hanushevsky, A.**
Verge of One Petabyte: The Story Behind the BaBar Database – 167
- Harder, J.**
SORCE and Future Satellite Observations of Solar Irradiance – 239
- Harmon, Julie P.**
Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
- Harris, Kristi**
Holographic Optical Storage Using Photorefractive Polymers – 187
- Harris, Michael M.**
Mapping Charting and Geodesy Branch. Abstracts of Publications 2000-2002 – 78
- Hart, W. D.**
Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – 88
- Hart, William**
Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – 88
- Harvey, Steven P.**
Hydrolysis of Levinstein Mustard (H) – 36
- Hasan, A.**
Verge of One Petabyte: The Story Behind the BaBar Database – 167
- Hasan, M. A.**
Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – 200
- Hashimoto, K. Kumiko**
Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field – 93
- Magnetosphere: Evolution of the Ionospheric Convection Due to Changes in the Interplanetary Magnetic Field – 90
- Hasholder, Jean-Max**
CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft – 3
- Hasselrot, A.**
Reduction of the Noise and Gas Emissions Generated by the Activity of the Swedish Air Force Preliminary Studies – 83
- Hatae, T.**
Characteristics of the H-Mode Pedestal and Extrapolation to ITER – 191
- Hathaway, David**
Coronal Heating, Spicules, and Solar-B – 238
- Haugan, T.**
Flux-Pinning of BiSr₂CaCu₂O₈ + delta) High T_c Superconducting Tapes Utilizing (Sr,Ca)₁₄Cu₂₄O(41 + delta) and Sr₂CaAl₂O₆ Defects – 35
- Havelund, Klaus**
Applying Jlint to Space Exploration Software – 153
- EAGLE can do Efficient LTL Monitoring – 158
- EAGLE Monitors by Collecting Facts and Generating Obligations – 148
- Execution-Based Model Checking of Interrupt-Based Systems – 157
- Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147
- Rule-Based Runtime Verification – 158
- Haverlock, T. J.**
Caustic-Side Solvent Extraction: Anticaking Surfactants Found to be Cause of Apparent Effect of High Nitrite Concentration on Cesium Stripping – 28
- Hayden, L. Michael**
Holographic Optical Storage Using Photorefractive Polymers – 187

- Heap, Sara R.**
Emission Line Galaxies in the STIS Parallel Survey – 217
- Hebert, James R.**
Quasi-Pro prospective Study of Breast Cancer and Diet – 134
- Heeger, Alan J.**
Charge Transfer Polymers as Ultrafast Holographic Materials – 45
- Heifets, S.**
Single-Mode Coherent Synchrotron Radiation Instability – 182
- Heller, J. M.**
Are Gulf War Veterans Experiencing Illness Due to Exposure to Smoke from Kuwaiti Oil Well Fires? Examination of Department of Defense Hospitalization Data – 131
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
- Hellerman, S.**
Stringy Resolutions of Null Singularities – 179
- Hellman, F.**
Growth Induced Magnetic Anisotropy in Crystalline and Amorphous Thin Films – 38
- Hermanns, Anno**
Polymer Light-Emitting Diode (PLED) Process Development – 57
- Herrmann, Scott**
Polymer Light-Emitting Diode (PLED) Process Development – 57
- Herron, Dale**
Systems-Level Energy Audit for Main Complex, Construction Engineering Research Laboratory – 81
- Hester, R.**
Stimuli-Responsive Polymers with Enhanced Efficiency in Reservoir Recovery Processes. Semiannual Progress Report for Work Performed September 1, 2001 through February 28, 2002 – 26
- Hill, Robert S.**
Emission Line Galaxies in the STIS Parallel Survey – 217
- Hilsenrath, E.**
Validation of Envisat Ozone Data Products using Satellite and Ground Based Data – 96
- Hilton, Susan**
Cognitive Measures of Vietnam-Era Prisoners of War – 131
- Himmler, A.**
WOPPER, Version 1.1: A Monte Carlo Event Generator for Four Fermion Production at LEP-II and Beyond – 166
- Hindmarsh, B.**
Characterization of Soluble Organic in Produced Water – 35
- Hinds, Philip W.**
Kinase Independent Functions of Cyclin D1 Which Contribute to its Oncogenic Potential In Vivo – 133
- Hinkle, Jason**
Precision Structural Mechanics Instrumentation System – 157
- Hirata, K.**
Symplectic Beam-Beam Interaction with Energy Change – 166
- Hites, M.**
PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – 3
- Hittle, J. D.**
Genesis Discovery Mission: Science Canister Processing at JSC – 237
- Hlavka, D. L.**
Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – 88
- Hlavka, Dennis**
Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – 88
- Hodur, Richard M.**
Mean COAMPS Air-Sea Fluxes Over the Mediterranean During 1999 – 48
- Hogan, Beverly**
Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – 128
- Hogan, John A.**
An On-line Technology Information System (OTIS) for Advanced Life Support – 207
- Hogan, M. J.**
Summary Report of Working Group 4: Electron Beam Driven Concepts – 198
- Holekamp, Kara**
Radiometric Characterization of IKONOS Multispectral Imagery – 77
- Home, C.**
Derivation of a Tasseled Cap Transformation Based on Landsat 7 At-Satellite Reflectance – 15
- Hong, Young-Soo**
Use of Plastic Capillaries for Macromolecular Crystallization – 132
- Honishi, Takashi**
Spot Information Navigator – 55
- Hooper, T. I.**
Are Gulf War Veterans Experiencing Illness Due to Exposure to Smoke from Kuwaiti Oil Well Fires? Examination of Department of Defense Hospitalization Data – 131
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
- Hopkins, R. C.**
Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17
- Horswill, Ian**
Shared Semantic Representations for Coordinating Distributed Robot Teams – 151
- Hou, Arthur**
Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space – 98
- Houghton, M.**
ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – 19
- Houston, B. H.**
Preliminary Observations Regarding LDV Scans of Panels Excited by Broadband Actuators at the US Capitol – 72
- Houts, M. G.**
Overview of Non-nuclear Testing of the Safe, Affordable 30-kW Fission Engine, Including End-to-End Demonstrator Testing – 22
- Hovmark, G.**
Annual Report 2002 on FOI's Research on Air Vehicles (FOT 25) – 2
- Hruby, V.**
ST7-DRS: A Step Towards Drag-free and High-precision Formation Control – 19
- Hsieh, W.**
Parameter Comparison for Low-Noise MoAu TES Bolometers – 74
- Hsieh, Wen-Ting**
A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188
- Hsu, W. H.**
Development of Real-Time Measurement of Effective Dose for High Dose Rate Neutron Fields – 177
- Huang, C.**
Derivation of a Tasseled Cap Transformation Based on Landsat 7 At-Satellite Reflectance – 15
- Huang, D. H.**
Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25
- Huang, X. Z.**
Motion Effects on Leading-Edge Vortex Behavior over Delta Wings and Generalized Modeling – 7
- Huang, Z.**
Frequency Chirped SASE FEL – 178
- Hubbard, A.**
Characteristics of the H-Mode Pedestal and Extrapolation to ITER – 191
- Huebner, Lawrence D.**
Exhaust Simulation Testing of a Hypersonic Airbreathing Model at Transonic Speeds – 13

- Huff, Dennis**
Ultra High Bypass Ratio Low Noise Engine Study – [12](#)
- Huffman, George J.**
Westerly Wind Events in the Eastern Indian Ocean as a Precursor to El Nino: A Case Study for the 2002-03 El Nino – [103](#)
- Hughes, Steve P.**
Orbit Design for Phase I and II of the Magnetospheric Multiscale Mission (MMS) – [87](#)
- Hughes, William O.**
Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – [18](#)
- Hultgren, P.**
Triggering of Convection – [100](#)
- Humenik, James A.**
Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – [205](#)
- Humensky, T. B.**
SLAC Polarized Electron Source and Beam for E-158 – [199](#)
- Hummel, D.**
A New Vortex Flow Experiment for Computer Code Validation – [150](#)
- Humphreys, D. A.**
Advanced Tokamak Operation Using the DIII-D Plasma Control System – [193](#)

Complete Suppression of the $m=2/n=1$ Neoclassical Tearing Mode using Electron Cyclotron Current Drive on DIII-D – [178](#)

Physics and Control of ELMing H-Mode Negative Central Shear Advanced Tokamak Scenario Based on Experimental Profiles for ITER – [191](#)
- Hunag, Z.**
Calculation and Optimization of Laser Acceleration in Vacuum – [175](#)
- Huo, Winifred M.**
Dissociative Ionization and Product Distributions of Benzene and Pyridine by Electron Impact – [38](#)
- Hyams, D.**
Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – [66](#)
- Hyams, Kenneth C.**
Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – [128](#)
- Hyatt, A. W.**
Advanced Tokamak Operation Using the DIII-D Plasma Control System – [193](#)

Complete Suppression of the $m=2/n=1$ Neoclassical Tearing Mode using Electron Cyclotron Current Drive on DIII-D – [178](#)
- Demonstration in the DIII-D Tokamak of an Alternate Baseline Scenario for ITER and Other Burning Plasma Experiments – [190](#)
- Stationary High-Performance Discharges in the DIII-D Tokamak – [190](#)
- Hyers, R. W.**
A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – [42](#)

Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – [42](#)

Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – [42](#)
- Iacovazzi, R., Jr.**
Regional Variability in Convection and Rain Retrievals from the TRMM Microwave Imager (TMI) – [101](#)
- Ida, Minoru**
NTT Technical Review – [53](#)
- Igarashi, Kiyoshi**
Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards – [239](#)
- Ikeda, Takashi**
Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – [155](#)
- Imfeld, H. L.**
Pellissier H5 Hydrostatic Level – [184](#)
- Ippolito, Corey**
Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles – [21](#)
- Irwin, J.**
Model Independent Analysis of Beam Dynamics in Accelerators – [169](#)
- Ishidzuka, S.**
Time-Resolved Photoelectron Spectroscopy of Oxidation on the Ti(0001) Surface – [33](#)
- Iwata, Hideyuki**
NTT Technical Review – [53](#)
- Jack, I.**
Asymptotic Pade Approximant Predictions: up to Five Loops in QCD and SQCD – [174](#)
- Jackson, G. L.**
Resistive Wall Modes and Plasma Rotation in DIII-D – [192](#)
- Jacobs, Patricia A.**
Modeling and Analysis of Uncertain Time-Critical Tasking Problems (UTCTP) – [164](#)
- Jacobs, Steven A.**
Design and Simulation of Transmission Properties of Hollow Bragg Fibers Fabricated from Omnidirectionally Reflective Composite Dielectric Materials – [58](#)
- Jacobson, David T.**
50 KW Class Krypton Hall Thruster Performance – [21](#)
- Jacobson, David**
Investigation of Low-Voltage/High-Thrust Hall Thruster Operation – [21](#)
- Jain, Amit**
A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – [156](#)
- Jakubowski, M.**
Experimental Characterization of Coherent, Radially-Sheared Zonal Flows in the DIII-D Tokamak – [63](#)
- James, Dianne M.**
Mapping Charting and Geodesy Branch. Abstracts of Publications 2000-2002 – [78](#)
- Jedenmalm, A.**
Antimicrobial Surface Treatments of Aluminium in Air Conditioning Systems – [43](#)
- Jen, Alex K-Y.**
Instrumentation Facility for the Evaluation of Photonic and Opto-Electronic Materials – [59](#)
- Jeng, Meei-Huey**
In Vivo Transcriptional Activation of Estrogen Receptor Target Genes: Differential Regulation in Mammary Gland Uterus and Bone – [118](#)
- Jensen, T. H.**
Resistive Wall Modes and Plasma Rotation in DIII-D – [192](#)
- Jernigan, T. C.**
Advanced Tokamak Operation Using the DIII-D Plasma Control System – [193](#)
- Ji, H.**
Circulation in a Short Cylindrical Couette System – [66](#)
- Jin, Hao-Qiang**
An Expert System for the Development of Efficient Parallel Code – [152](#)
- Jin, Haoqiang**
Performance Characteristics of the Multi-Zone NAS Parallel Benchmarks – [152](#)
- Johansson, D.**
Time Synchronization of a TDA-Based Position Finding System – [61](#)
- Johnson, Robert D.**
Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – [36](#)
- Jones, D. R. T.**
Asymptotic Pade Approximant Predictions: up to Five Loops in QCD and SQCD – [174](#)
- Jones, Harry**
Design Rules for Life Support Systems – [137](#)

Equivalent Mass versus Life Cycle Cost for Life Support Technology Selection – [136](#)

- Jones, Robert E.**
Advanced Guidance and Control for Hypersonics and Space Access – 16
- Jonkman, J.**
Demonstration of the Ability of RCAS to Model Wind Turbines – 2
Investigation of the IEC Safety Standard for Small Wind Turbine Design through Modeling and Testing – 2
- Jonsson, Ari K.**
Scoping Planning Agents With Shared Models – 160
- Jorgensen, S.**
Cold-Start and Warm-Up Driveability Performance of Hybrid Electric Vehicles Using Oxygenated Fuels: Piggyback Project to the Volatility Group Intermediate-Temperature Program (CM-138-02) – 23
- Jost, Gabriele**
An Expert System for the Development of Efficient Parallel Code – 152
Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications – 157
- Jovanov, Emil**
The War Fighter's Stress Response: Telemetric and Noninvasive Assessment – 121
- Ju, Bong-Gun**
The Role of N-CoR During Normal Mammary Gland Development – 109
- Juhasz, Albert J.**
High Temperature Fusion Reactor Cooling Using Brayton Cycle Based Partial Energy Conversion – 22
- Jull, A. J. T.**
Organic Compounds in Martian Meteorites May be Terrestrial Contaminants – 228
- Jurewicz, A. J. G.**
Genesis Solar-Wind Sample Return Mission: The Materials – 237
- Jusem, Juan Carlos**
Recent Observing System Simulation Experiments at the NASA DAO – 101
- Kachru, S.**
de Sitter Vacua in String Theory – 168
- Kaganovich, I. D.**
Comparison of Quantum Mechanical and Classical Trajectory Calculations of Cross Sections for Ion-Atom Impact Ionization of Negative- and Positive-Ions for Heavy Ion Fusion Applications – 193
Self-Consistent System of Equations for a Kinetic Description of the Low-Pressure Discharges Accounting for the Nonlocal and Collisionless Electron Dynamics – 193
- Kaganovich, I.**
Scaling of Cross Sections for Ion-Atom Impact Ionization – 35
- Kageyama, A.**
Circulation in a Short Cylindrical Couette System – 66
- Kai Wong, W.**
Supersymmetric Rotating Black Holes and Attractors – 219
- Kaita, R.**
Investigations of Low and Moderate Harmonic Fast Wave Physics on CDX-U – 182
- Kajiwar, K.**
Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak – 192
- Kalosh, R.**
de Sitter Vacua in String Theory – 168
STU Black Holes and String Triality – 220
Supersymmetric Rotating Black Holes and Attractors – 219
- Kalpakis, Konstantinos**
Architectural Design for the Global Legal Information Network – 203
- Kamath, C.**
Initial Experiences with Retrieving Similar Objects in Simulation Data – 181
- Kamiya, Koki**
Passive Superconducting Shielding: Experimental Results and Computer Models – 197
- Kang, H. K.**
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
- Karliner, M.**
Asymptotic Padé Approximant Predictions: up to Five Loops in QCD and SQCD – 174
- Karoly, S. J.**
Single Integrated Air Picture (SIAP) Attributes – 150
- Karresand, M.**
Proposed Taxonomy of Software Weapons – 140
- Kasahara, Noriyuki**
Improving Retroviral Vectors for Gene Therapy of Prostate Cancer – 133
- Katagiri, Yoshitada**
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 186
- Kaufman, Daniel J., Jr**
Research Plan of the Operations Research Center and Department of Systems Engineering for Academic Year 2004 – 164
- Kaufman, Yoram J.**
Remote Sensing of Aerosol using MODIS, MODIS+CALIPSO and with the AEROSAT Concept – 97
- Kaurila, T.**
Aerosol Attenuation Model for Scandinavian Environment: Based on Measurements at Loevsætra in Uppland – 138
- Kay, Edmond**
An Assessment of the Potential for Increasing the Salvageability of Critical Combat Traumas Through First Responder Interventions – 132
- Keams, Ed**
Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104
- Keating, Christopher**
Cratering of the Moon – 231
Kepler's Laws of Planetary Motion – 221
Phases of the Moon – 226
The Center of the Galaxy – 214
The Optical Telescope – 213
The Sun – 213
- Kegerise, Michael A.**
Real-Time Adaptive Control of Flow-Induced Cavity Tones – 62
- Kelley, John V.**
HVOF Application of Nickel and Nickel Alloy to Tungsten Heavy Alloy for Jacketed Penetrators – 40
- Kellman, A. G.**
Demonstration in the DIII-D Tokamak of an Alternate Baseline Scenario for ITER and Other Burning Plasma Experiments – 190
Stationary High-Performance Discharges in the DIII-D Tokamak – 190
- Kellock, A. J.**
Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – 39
- Kelly, Michelle**
Radiometric Characterization of IKONOS Multispectral Imagery – 77
- Kelton, K. F.**
A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – 42
Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – 42
Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42
- Kern, Francis G.**
Novel Inhibitors of FGF Signal Transduction in Breast Cancer: Targeting the FGFR Adapter Protein SNT-1 – 109
- Ketola, Kurt S.**
Tribometric Optical and Electrical Properties of Sputtered Quasicrystalline – 29
- Khalid, M.**
Unsteady Flows and Airfoil-Vortex Interaction – 6

- Khazanov, George V.**
Stormtime Particle Energization with AMIE Potentials – 88
- Khomenko, V.**
Logic Synthesis Avoiding State Space Explosion – 139
- Kiefer, Walter S.**
Europa and Titan: Oceans in the Outer Solar System? – 209
Impact Craters in the Solar System – 233
- Kihara, Tamio**
Spot Information Navigator – 55
- Kikuchi, Nobuhiko**
Monolithically Integrated 64-channel WDM Channel Selector – 54
- Kikuchi, Takashi**
Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards – 239
Magnetosphere: Transmission Line Model for the Ground Magnetic Disturbances – 90
Space Weather and its Hazards on the High-Tech System – 240
Transmission Line Model for Ground Magnetic Disturbances – 92
- Kilbane, Russell**
HVOF Application of Nickel and Nickel Alloy to Tungsten Heavy Alloy for Jacketed Penetrators – 40
- Kilpatrick, Kay**
Ocean Primary Production Estimates from Terra MODIS and Their Dependency on Satellite Chlorophyll Alpha Algorithms – 104
- Kim, K. J.**
Complete Characterization of a Chaotic Optical Field using a High-Gain Self-Amplified Free-Electron Laser – 188
- Kim, Kami**
Novel Lishmania and Malaria Potassium Channels: Candidate Therapeutic Targets – 110
- King, Matt**
Possible Stick-Slip Mechanism for Whirlans Ice Stream – 92
- King, Michael D.**
Global Multispectral Cloud Retrievals from MODIS – 69
- Kitagawa, Yukako**
Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions – 203
- Klimack, William K.**
Research Plan of the Operations Research Center and Department of Systems Engineering for Academic Year 2004 – 164
- Knight, Doyle D.**
Localized Flow Control in High Speed Flows Using Laser Energy Deposition – 5
- Knuth, Kevin H.**
Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – 162
- Kobayashi, Junya**
NTT Technical Review – 53
- Kobel, Mark**
Thermal Vacuum Testing of Swift XRT Ethane Heat Pipes – 65
- Koehe, Jessica**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59
- Koelbl, Terry G.**
Digital Avionics – 12
- Koelegard, R.**
Effects of Markedly Increased Intravascular Pressure on the Volume-Flow Characteristics in Venous Vessels of Human Limbs – 1
- Kol, B.**
Counting Schwarzschild and Charged Black Holes – 220
- Kopicz, Charles**
Investigation of Impinging Stream Vortex Chamber Concepts for Liquid Rocket Engine Applications – 23
- Kopp, G.**
SORCE and Future Satellite Observations of Solar Irradiance – 239
- Koshak, William**
Analytic Solution to the Problem of Aircraft Electric Field Mill Calibration – 162
- Koskinen, H.**
Connectivity and Reliability in Ad Hoc Networks – 50
- Kostoff, Ronald N.**
Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – 205
Science and Technology Text Mining: Hypersonic and Supersonic Flow – 203
- Koutny, M.**
Logic Synthesis Avoiding State Space Explosion – 139
- Kovacs, P.**
The Potential for solar Heat for Industrial Processes: A Preliminary Study of Swedish Possibilities – 80
- Kovscek, T.**
Intercomparison of Numerical Simulation Codes for Geologic Disposal of CO₂ – 84
- Kraemer, K. E.**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – 215
- Kramer, G. J.**
New Interpretation of Alpha-Particle-Driven Instabilities in Deuterium-Tritium Experiments on the Tokamak Fusion Test Reactor – 189
- Krasowski, Michael J.**
Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation – 159
- Krause, E.**
Normal Shock Vortex Interaction – 7
- Krinsky, S.**
Complete Characterization of a Chaotic Optical Field using a High-Gain Self-Amplified Free-Electron Laser – 188
Frequency Chirped SASE FEL – 178
Perturbation Expansion for High-Gain Free-Electron Laser Saturation – 72
- Krucker, Saem**
RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – 241
- Ku, Jentung**
Thermal Vacuum Testing of Swift XRT Ethane Heat Pipes – 65
- Kuerklu, Elif**
Observations on SOFIA Observation Scheduling: Search and Inference in the Face of Discrete and Continuous Constraints – 202
- Kuguoglu, Latife**
Structural Evaluation of Exo-Skeletal Engine Fan Blades – 75
- Kuhns, Jay**
Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – 206
- Kulshrestha, U. C.**
Precipitation Chemistry Studies in India: A Search for Regional Patterns – 100
- Kumar, Anurag**
San Clemente Island Undersea Range Acoustic Experiment, July 2002 – 185
- Kunz, Clay**
Terrain Model Registration for Single Cycle Instrument Placement – 235
- Kurokawa, Hiroki**
Solar and Solar Wind: Energy Build-up Study of Solar Flares – 239
Study of Energy Build-up in Solar Flares – 240
- Kusel, Julian**
Polymer Light-Emitting Diode (PLED) Process Development – 57
- Kwinn, Michael J., Jr.**
Research Plan of the Operations Research Center and Department of Systems Engineering for Academic Year 2004 – 164
- La Haye, R. J.**
Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – 195
Complete Suppression of the m=2/n=1 Neoclassical Tearing Mode using Electron Cyclotron Current Drive on DIII-D – 178

- Discharge Improvement through Control of Neoclassical Tearing Modes by Localized ECCD in DIII-D – 192
- Labarta, Jesus**
An Expert System for the Development of Efficient Parallel Code – 152
- Labov, G.**
Validation of Envisat Ozone Data Products using Satellite and Ground Based Data – 96
- Lacser, A.**
Implementation of an Urban Canopy Parameterization in MM5 for Meso-Gamma-Scale Air Quality Modeling Applications – 95
- Lafata, Jennifer E.**
Understanding Racial Disparities in Mammography Use Among Breast Cancer Survivors – 135
- Lahlouh, B.**
Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25
- Lakatos, Stephen**
Mental Representation of Auditory Sources – 184
- Lamarche, Teresa**
Digital Avionics – 12
- Landis, Mark W.**
Kinase Independent Functions of Cyclin D1 Which Contribute to its Oncogenic Potential In Vivo – 133
- Lane, Suzanne E.**
Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – 128
- Lao, L. L.**
Physics and Control of ELMing H-Mode Negative Central Shear Advanced Tokamak Scenario Based on Experimental Profiles for ITER – 191
Quantitative Tests of ELMs as Intermediate n Peeling-Ballooning Modes – 192
- Largo, Sherly R.**
The Specific Refractive Index Increment for Isobutyl Pss-Polystyrene Copolymers – 37
- Larson, Gerald E.**
Predictors of Navy Attrition. II. A Demonstration of Potential Usefulness for Screening – 111
- Larsson, A.**
Electrical Equivalent Circuit Simulations of the Pulsed-Power Conditioning System TTHPM – 56
Fast Charging of Capacitors: A Summary of a Master Thesis at Uppsala University – 57
Voltage Gradient Along a Lightning Channel During Strikes to Aircraft – 1
- Lau, Benton**
Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles – 21
- Laurence, T. A.**
Photon-Counting Single-Molecule Spectroscopy for Studying Conformational Dynamics and Macromolecular Interactions – 32
- Lawrence, G.**
SORCE and Future Satellite Observations of Solar Irradiance – 239
- Le Cocq, C.**
LEGO: A Modular Approach to Accelerator Alignment Data Analysis – 179
- Lee, Anthony J.**
Studies on the Novel Anticancer Agents Metabolically Formed from 17-Beta-Estradiol – 123
- Lee, Cheng S.**
Field-effect Flow Control in Polymer Microchannel Networks – 61
- Lee, Chung**
Expression of Transforming Growth Factor-Beta (TGF- Beta) in Prostate Cancer Progression – 135
- Lee, D. C.**
Application- and Network-Cognizant Proxies – 155
- Lee, G. W.**
A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – 42
Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – 42
Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42
- Lee, Jason S.**
A Comparison of Biotic and Inorganic Sulfide Films – 34
- Lee-Rausch, E. M.**
Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – 62
- Lefkowitz, Elliot J.**
Development of a Viral Biological-Threat Bioinformatics Resource – 131
- Leftwich, T. E.**
Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – 97
- Leijon, S.**
Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstrator – 51
- Leonard, A. W.**
ELM Particle and Energy Transport in the SOL and Divertor of DIII-D – 191
Quantitative Tests of ELMs as Intermediate n Peeling-Ballooning Modes – 192
Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – 192
- Leroy, Annie**
Unsteady Aerodynamic Model for Thin Wings With Evolutive Vortex Sheets – 4
- Leslie, F. W.**
Magnetic Control of Solutal Buoyancy-driven Convection – 63
- Lester, Luke F.**
High Power Mid-IR Semiconductor Lasers for LADAR – 71
- Leuer, J. A.**
Physics and Control of ELMing H-Mode Negative Central Shear Advanced Tokamak Scenario Based on Experimental Profiles for ITER – 191
- Levine, Stanley R.**
C/SiC Life Prediction for Propulsion Applications – 31
- Levri, Julie A.**
An On-line Technology Information System (OTIS) for Advanced Life Support – 207
- Lewandowski, J. L. V.**
Improved Conservation Properties for Particle-in-cell Simulations with Kinetic Electrons – 194
Multi-Grid Particle-in-cell Simulations of Plasma Microturbulence – 194
Numerical Loading of a Maxwellian Probability Distribution Function – 176
- Lewellen, J. W.**
Complete Characterization of a Chaotic Optical Field using a High-Gain Self-Amplified Free-Electron Laser – 188
- Lewis, Russell J.**
Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – 36
- Li, D.**
Experimental Measurement of Resonance Islands Induced by the RF Voltage Modulation – 175
- Li, Jing**
Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
- Li, Jui-Lin**
Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space – 98
- Li, Jun**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59
- Li, Rongbao**
Novel Inhibitors of FGF Signal Transduction in Breast Cancer: Targeting the FGFR Adapter Protein SNT-1 – 109
- Li, X.**
Aspects of the Mechanical Behavior of Stitched T300 Mat/Urethane 420 IMR Composite – 30

- Li, Y.**
Complete Characterization of a Chaotic Optical Field using a High-Gain Self-Amplified Free-Electron Laser – 188
- Liscomb, Elizabeth A.**
The Role of Neuropilin in Breast Cancer Metastasis – 119
- Liemohn, Michael W.**
Stormtime Particle Energization with AMIE Potentials – 88
- Lin, Mike C.**
Compressed Air System Survey at Army Industrial Facilities – 66
Compressed Air System Survey at Sierra Army Depot, CA – 81
Systems-Level Energy Audit for Main Complex, Construction Engineering Research Laboratory – 81
- Lin, Shian-Jiann**
Global Weather Prediction and High-End Computing at NASA – 101
- Linde, A.**
de Sitter Vacua in String Theory – 168
- Lindell, I. V.**
Closed Form Solutions of Maxwell's Equations in the Computer Age – 140
Electrostatic Image Theory for the Anisotropic Boundary – 172
Electrostatic Image Theory for Two Intersecting Conducting Spheres – 173
- Lindler, Don J.**
Emission Line Galaxies in the STIS Parallel Survey – 217
- Lindqvist, P.**
A Base for the Construction of a Calibration Current Source – 56
- Liou, Shy-Sheng**
Compressed Air System Survey at Sierra Army Depot, CA – 81
- Lissauer, Jack J.**
The Stability of Orbital Configurations and the Ultimate Configurations of Planetary and Satellite Systems – 215
- Litchford, R. J.**
Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17
- Litt, Jonathan S.**
Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation – 159
- Little, Brenda J.**
A Comparison of Biotic and Inorganic Sulfide Films – 34
- Liu, Danny D.**
Nonlinear Reduced-Order Modeling of Limit Cycle Oscillations of Aircraft Wings and Wing/Store – 64
- Liu, J. C.**
Radiation Protection at High-Energy Electron Accelerators – 48
- Liu, Jie**
Fabrication and Modification of Metal and Semiconductor Nanostructures Using Atomic Force Microscope – 59
- Logg, C.**
Overview of IEPME-BW Bandwidth Testing of Bulk Data Transfer – 49
- Lohn, Jason**
A Comparison of Techniques for Scheduling Fleets of Earth-Observing Satellites – 202
- Lohr, J.**
Discharge Improvement through Control of Neoclassical Tearing Modes by Localized ECCD in DIII-D – 192
ECE Radiometer Upgrade on the DIII-D Tokamak – 194
Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak – 192
- Longley, S. W.**
Hot Cell Facility (HCF) Safety Analysis Report – 186
- Lopez-Benitez, Noe**
Task Assignment Heuristics for Parallel and Distributed CFD Applications – 65
- Lorand, Robert T.**
Compressed Air System Survey at Army Industrial Facilities – 66
- Loska, Z.**
Variability of Accretion Flow in the Core of the Seyfert Galaxy NGC 4151 – 218
- Lossett, Ira**
Engine Blowdown Device – 73
- Lovell, D. A.**
Military Vortices – 4
- Lowe, Scott W.**
Analysis of Apaf-1 and Caspase 9 in Tumorigenesis – 108
- Lowry, Mike**
Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147
- Lu, Yijiang**
Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
- Lubguban, J. A.**
Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25
- Lucas, Mary A.**
Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation – 29
- Luce, T. C.**
Advanced Tokamak Profile Evolution in DIII-D – 194
Complete Suppression of the $m=2/n=1$ Neoclassical Tearing Mode using Electron Cyclotron Current Drive on DIII-D – 178
- Demonstration in the DIII-D Tokamak of an Alternate Baseline Scenario for ITER and Other Burning Plasma Experiments – 190
- Discharge Improvement through Control of Neoclassical Tearing Modes by Localized ECCD in DIII-D – 192
- Stationary High-Performance Discharges in the DIII-D Tokamak – 190
- Luck, R.**
Effect of Applied Pressure During Feeding of Critical Cast Aluminum Alloy Components with Particular Reference to Fatigue Resistance – 40
- Luckring, J. M.**
Compressibility and Leading-Edge Bluntness Effects for a 65 Deg Delta Wing – 10
- Luckring, James M.**
Technical Evaluation Report, Part A - Vortex Flow and High Angle of Attack – 5
- Lueth, V. G.**
Study of Inclusive Semileptonic B Meson Decays with the BABAR Detector – 200
- Luo, H.**
Characterization of Soluble Organic in Produced Water – 35
- Lyes, P. A.**
Vortex Effects in the Dynamics of Underwater Weapons – 153
- Maartense, Iman**
Development of Nickel Alloy Substrates for Y-Ba-Cu-O Coated Conductor Applications – 38
- MacGill, R. A.**
S-Shaped Magnetic Macroparticle Filter for Cathodic ARC Deposition – 44
- MacIver, J.**
Evaluation of Cracking in Pre-Service and In-Service Snow Plow Carbide Wear Surfaces – 27
- Maeda, Yoichi**
Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 55
- Magnusson, S.**
Development of an Instrument for Measuring Team Performance Potential – 137
Dynamic Measurement of the Operator for Future System Development – 11
- Mahesh, A.**
Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – 88
- Mahn, J. A.**
Hot Cell Facility (HCF) Safety Analysis Report – 186
- Mahoney, My G.**
Molecular Characterization of Squamous Cell Carcinomas Derived From Recesive Dystrophic Epidermolysis Bullosa – 134

- Maidanik, G.**
Are the Energy Analysis (EA) and the Statistical Energy Analysis (SEA) compatible? – 164
- Majeski, R.**
Investigations of Low and Moderate Harmonic Fast Wave Physics on CDX-U – 182
- Makihara, Mitsuhiro**
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 186
- Malang, S.**
Advanced High Performance Solid Wall Blanket Concepts – 195
- Malkin, V. M.**
Finite-Duration Seeding Effects in Powerful Backward Raman Amplifiers – 183
- Mallama, Anthony**
NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – 72
- Malmuth, Norman**
PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – 3
- Maluda, J. W.**
Single Integrated Air Picture (SIAP) Attributes – 150
- Mamou, M.**
Unsteady Flows and Airfoil-Vortex Interaction – 6
- Manakos, P.**
WOPPER, Version 1.1: A Monte Carlo Event Generator for Four Fermion Production at LEP-II and Beyond – 166
- Mandelkern, M.**
Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – 200
- Mannel, T.**
WOPPER, Version 1.1: A Monte Carlo Event Generator for Four Fermion Production at LEP-II and Beyond – 166
- Manneschmidt, E. T.**
Examination of Compatibility of Cavitation-Resistance Modifications to Type 316LN Stainless Steel in a Mercury Thermal Convection Loop – 39

Screening Test Results of Fatigue Properties of Type 316LN Stainless Steel in Mercury – 41
- Mansell, Dennis N.**
Summary of the Cloud Tracking and Sampling Experiments Conducted During the DIPOLE ORBIT and DIPOLE EAST Experiments – 96
- Manuvakhova, Marina S.**
Novel Inhibitors of FGF Signal Transduction in Breast Cancer: Targeting the FGFR Adapter Protein SNT-1 – 109
- Manzella, David H.**
50 KW Class Krypton Hall Thruster Performance – 21

Investigation of the Erosion Characteristics of a Laboratory Hall Thruster – 22
- Manzella, David**
Investigation of Low-Voltage/High-Thrust Hall Thruster Operation – 21
- Marboe, R. C.**
Instrumentation and Equipment Upgrades to Improve Acoustical and Fluid Dynamic Measurements in the Garfield Thomas Water Tunnel – 48
- Marder, A. R.**
Fe-Al Weld Overlay and High-Velocity Oxy-Fuel Thermal Spray Coatings for Corrosion Protection of Waterwalls in Fossil Fired Plants with Low NOx Burners – 34
- Margolis, Michael C.**
Upgradable Operational Availability Forecasting Tool For the U.S. Navy P-3 Replacement Aircraft – 11
- Markas, Tassos**
Image Compression: Algorithms and Architectures – 146
- Marriott, Darin**
Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – 189
- Martel, Linda M. V.**
Bands on Europa – 231

Big Mountain, Big Landslide on Jupiter's Moon, Io – 232

Damage by Impact: The Case at Meteor Crater, Arizona – 209

For a Cup of Water on Mars: Gusev Crater – 230

Searching Antarctic Ice for Meteorites – 228

The Europa Scene in the Voyager-Galileo Era – 232
- Martelli, F.**
Heat Transfer Modelling in Gas Turbine Stage – 13
- Martin, J. J.**
Overview of Non-nuclear Testing of the Safe, Affordable 30-kW Fission Engine, Including End-to-End Demonstrator Testing – 22
- Martin, P. T.**
Automated Data Collection, Analysis, and Archival – 204
- Martin, Paul J.**
Mean COAMPS Air-Sea Fluxes Over the Mediterranean During 1999 – 48
- Martorell, Xavier**
Employing Nested OpenMP for the Parallelization of Multi-Zone Computational Fluid Dynamics Applications – 157
- Marubashi, Katsuhide**
Interplanetary Magnetic Flux Ropes – 241

Solar and Solar Wind: Interplanetary Magnetic Flux Ropes – 89
- Marufu, L. T.**
Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – 85
- Maruno, Tohru**
Recent Progress in Optical Switching Device Technologies in NTT – 49
- Maruyama, Takashi**
Ionosphere and Thermosphere: Ionospheric Irregularities – 89

Ionospheric Irregularities – 93
- Mather, John C.**
Town Hall Meeting Presentation – 216
- Mathioulakis, D. S.**
An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack – 6
- Matsuo, Shinji**
A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 55
- Matusik, Robert J.**
Growth Inhibitory and Stimulatory Signals in Prostate Cancer – 121
- Mavriplis, D. J.**
Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – 62
- Maynard, Nancy G.**
Moving NASA Remote Sensing Data to the GIS Environment for Health Studies – 77

Satellites as Sentinels for Climate and Health – 70

Working Toward a Healthy Planet – 135
- Maynard, Nancy**
PAIRS, The GIS-Based Incident Response System for Pennsylvania, and NASA – 91
- Mayr, Hans G.**
Reversing Flows and Heat Spike: Caused by Solar g-Modes? – 76
- McCarthy, Thomas V.**
Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – 20
- McClernon, Christopher K.**
Human Performance Effects of Adaptive Automation of Various Air Traffic Control Information Processing Functions – 9
- McClintock, W.**
SORCE and Future Satellite Observations of Solar Irradiance – 239

- McCormick, C.**
Stimuli-Responsive Polymers with Enhanced Efficiency in Reservoir Recovery Processes. Semiannual Progress Report for Work Performed September 1, 2001 through February 28, 2002 – [26](#)
- McDonald, Thomas**
Novel Lishmania and Malaria Potassium Channels: Candidate Therapeutic Targets – [110](#)
- McDonald, William W.**
A Bayesian Model for the Analysis of Quantal Response Data – [163](#)

MBR-A Computer Program for Performing Nonparametric Bayesian Analyses of Ordered Binomial Data – [163](#)
- McFadin, L.**
Amateur Radio on the International Space Station - Phase 2 Hardware System – [61](#)
- McGann, Conor**
Scoping Planning Agents With Shared Models – [160](#)
- McGarry, Jan**
NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – [72](#)
- McKee, G. R.**
Experimental Characterization of Coherent, Radially-Sheared Zonal Flows in the DIII-D Tokamak – [63](#)

Transport by Intermittency in the Boundary of the DIII-D Tokamak – [180](#)
- McKeever, J. W.**
Dual Mode Inverter Control Test Verification – [57](#)
- McKinley, G.**
Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – [45](#)
- McLachlan, Blair G.**
Effects of Various Fillet Shapes on a 76/40 Double Delta Wing from Mach 0.18 to 0.7 – [6](#)
- McLeskey, Sandra W.**
Fibrinolysis in Tumor Associated Angiogenesis – [108](#)
- McNab, A.**
BaBar Web Job Submission with Globus Authentication and AFS Access – [154](#)
- McSpadden, S. B.**
Cylindrical Wire Electrical Discharge Machining of Metal Bond Diamond Wheels Part II: Wheel Wear Mechanism – [45](#)
- Meech, Karen**
1997 Apparition of Comet Hale-Bopp Historical Comet Observations – [233](#)
- Mello, J. P.**
Performance and Economics of Catalytic Glow Plugs and Shields in Direct Injection Natural Gas Engines for the Next Generation Natural Gas Vehicle Program – [73](#)
- Melnikov, K.**
Self-Energy of Improved Staggered Quarks – [199](#)
- Menasce, Daniel A.**
A Scalability Model for ECS's Data Server – [144](#)

Performance Modeling of Network-Attached Storage Device Based Hierarchical Mass Storage Systems – [145](#)

Scalability Analysis and Use of Compression at the Goddard DAAC and End-to-End MODIS Transfers – [144](#)
- Menietti, J. D.**
Polar Plasma Wave Investigation Data Analysis in the Extended Mission – [218](#)
- Menzel, W. Paul**
Global Multispectral Cloud Retrievals from MODIS – [69](#)
- Mercurio, Arthur M.**
The Role of Neuropilin in Breast Cancer Metastasis – [119](#)
- Merritt, F. S.**
Weakly-Coupled Higgs Bosons and Precision Electroweak Physics – [170](#)
- Meuleau, Nicholas**
Hybrid Discrete-Continuous Markov Decision Processes – [141](#)
- Meyer, Allan W.**
SOFIA First Generation Science Instruments – [68](#)
- Meyyappan, M.**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – [59](#)
- Mezic, Igor**
Nonlinear Dynamics and Ergodic Theory Methods in Control – [64](#)
- Michaels, Scott**
Investigation of Impinging Stream Vortex Chamber Concepts for Liquid Rocket Engine Applications – [23](#)
- Michelson, P. F.**
Gamma-Ray Blazar Content of the Northern Sky – [223](#)
- Middlebrooks, B. L.**
Marine Mammal Health: Development of Immunodiagnostic and Viral Diagnostic Methodologies and Reagents – [123](#)
- Mikami, Hirohide**
Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – [155](#)

Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – [155](#)
- Mikekkides, Ioannis**
Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – [189](#)
- Mikellides, Pavlos**
Magnetic-Nozzle Studies for Fusion Propulsion Applications: Gigawatt Plasma Source Operation and Magnetic Nozzle Analysis – [189](#)
- Milholen, W. E.**
Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – [62](#)
- Miller, A.S.**
Vortex Flow Dilemmas and Control on Wing Planforms on High Speed – [4](#)
- Miller, Christopher W.**
San Clemente Island Undersea Range Acoustic Experiment, July 2002 – [185](#)
- Miller, Neil I.**
Observations and Calibrations of DMSP F15 SSM Data December 1999 - October 2000 – [48](#)
- Miller, Patrick**
Cratering of the Moon – [231](#)

Kepler's Laws of Planetary Motion – [221](#)

Phases of the Moon – [226](#)

The Center of the Galaxy – [214](#)

The Optical Telescope – [213](#)

The Sun – [213](#)
- Miller, Robert A.**
Thermal Conductivity and Stability of HfO₂-Y₂O₃ and La₂Zr₂O₇ Evaluated for 1650 C Thermal/Environmental Barrier Coating Applications – [25](#)
- Minato, Shin-Ichi**
NTT Technical Review – [53](#)
- Mine, Shin-Ichi**
Image Systems Using RFID Tag Positioning Information – [54](#)
- Minev, Boris R.**
Induction of Cytotoxic T Lymphocytes for Immunotherapy of Breast Cancer – [122](#)
- Minty, M.**
Model Independent Analysis of Beam Dynamics in Accelerators – [169](#)
- Misu, I.**
Technical Report of National Aerospace Laboratory: Transition Process of Boundary Layers on a Low-Speed Wind-Tunnel Contraction Wall – [2](#)
- Mitchell, Anthony**
Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings – [8](#)
- Mitchell, B.**
Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – [66](#)
- Mitchell, G. W.**
Hot Cell Facility (HCF) Safety Analysis Report – [186](#)
- Mitrani, I.**
High Coverage Multicasting for Mobile Ad-hoc Networks – [51](#)

- Miura, Norihiro**
Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 155
- Miyake, Wataru**
Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards – 239
- Mizuno, D. R.**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – 215
- Mizuno, Y.**
Time-Resolved Photoelectron Spectroscopy of Oxidation on the Ti(0001) Surface – 33
- Mobley, Frank**
E-3 In-Flight Acoustic Exposure Studies and Mitigation Via Active Noise Reduction Headset – 11
- Mokhov, N. V.**
Beam Collimation at Hadron Colliders – 199
- Mokry, M.**
Numerical Modelling of Vortex Flow Instabilities and Interactions – 8
- Molina-Jimenez, C.**
Contract Representation for Run-Time Monitoring and Enforcement – 138
Model Checking Correctness Properties of Electronic Contracts – 139
- Molton, Pascal**
Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings – 8
- Montgomery, Kevin**
NASA Virtual Glovebox: An Immersive Virtual Desktop Environment for Training Astronauts in Life Science Experiments – 19
- Moon, Y. -J.**
Flux Rope Acceleration and Enhanced Magnetic Reconnection Rate – 220
- Mooney, Vincent J., III**
Compiler Optimizations for Power-Aware Computing. Volume 1 of 2 – 153
Compiler Optimizations for Power-Aware Computing. Volume 2 of 2 – 143
- Moore, A. L.**
Supramolecular Structures for Photochemical Energy Conversion – 80
- Moore, J.**
Cognitive Measures of Vietnam-Era Prisoners of War – 131
- Moore, Jim**
Integrated Optical Design Analysis (IODA): New Test Data and Modeling Features – 152
- Moore, R. L.**
Eruption of a Multiple-Turn Helical Magnetic Flux Tube in a Large Flare: Evidence for External and Internal Reconnection that Fits the Breakout Model of Solar Magnetic Eruptions – 238
- Moore, Ron**
Coronal Heating, Spicules, and Solar-B – 238
- Moore, T. A.**
Supramolecular Structures for Photochemical Energy Conversion – 80
- Moore, T.**
Search for Bs Mixing with Inclusive Lepton Events at SLD – 167
- Moorhouse, David J.**
Design Issues Associated with Full-Scale Application of Active Control of Vortex Flows – 8
- Morandin, M.**
Distributed Offline Data Reconstruction in BABAR – 167
- Morariu, B.**
Noncommutative Geometry in M-Theory and Conformal Field Theory – 168
- Morgan, Charles A.**
The War Fighter's Stress Response: Telemetry and Noninvasive Assessment – 121
- Morris, Robert**
Essential Autonomous Science Inference on Rovers (EASIR) – 235
- Morton, Scott**
Flow Control of Vortical Structures and Vortex Breakdown over Slender Delta Wings – 8
- Moscattello, David K.**
Epidermal Growth Factor (EGF) Receptor Intron 1 CA Repeat Polymorphisms in African-American and Caucasian Males: Influence on Prostate Cancer Risk or Disease Progression and Interaction with Androgen Receptor CAG Repeat Polymorphisms – 107
- Moseley, S. H.**
Parameter Comparison for Low-Noise MoAu TES Bolometers – 74
- Moshhammer, H.**
Symplectic Beam-Beam Interaction with Energy Change – 166
- Moshovos, Andreas**
PACT: Power Aware Compilation and Architectural Techniques – 151
- Motakef, S.**
Analysis of Radial Segregation in Directionally Solidified Hg(0.89)Mn(0.11)Te – 43
- Mott, Brent**
A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188
- Moyer, B. A.**
Caustic-Side Solvent Extraction: Anti-Caking Surfactants Found to be Cause of Apparent Effect of High Nitrite Concentration on Cesium Stripping – 28
- Moyer, R. A.**
Transport by Intermittency in the Boundary of the DIII-D Tokamak – 180
- Mueller, A. H.**
Soft Gluons in the Finite Momentum Wave Function and the BFKL Pomeron – 175
- Muhitch, Joseph M.**
Apparatus and Method for Calibrating Voltage Spike Waveforms – 55
- Muisener, Patricia Anne O.**
Characterizations of Enriched Metallic Single-Walled Carbon Nanotubes in Polymer Composite – 30
- Mullany, Lisa K.**
Cell Cycle Dependent Regulation of Human Progesterone in Breast Cancer – 114
- Mullins, Jennifer**
Brief History of Gyroscopes – 178
- Mulloth, Lila M.**
Temperature Swing Adsorption Compressor Development – 74
- Mulqueen, John A.**
Advanced Guidance and Control for Hypersonics and Space Access – 16
- Munger, C. T.**
Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – 200
- Munoz, Cesar**
Proceedings STRATA 2003. First International Workshop on Design and Application of Strategies/Tactics in Higher Order Logics; Focus on PVS experiences – 165
- Murakami, M.**
Achieving and Sustaining Steady-State Advanced Tokamak Conditions on DIII-D – 190
Advanced Tokamak Profile Evolution in DIII-D – 194
- Murphy, Michael**
Mixing and Combustion in Vortex Dominated Combustors with Distributed Air and Fuel-Injection – 37
- Murphy, Patrick C.**
Computational Methods for Dynamic Stability and Control Derivatives – 14
- Murray, Stephen S.**
Development and Operations of the Astrophysics Data System – 219
- Mushotzky, Richard**
Disentangling X-Ray Emission Processes in Vela-Like Pulsars – 223
- Musmanno, Joseph**
Data Intensive Systems (DIS) Benchmark Performance Summary – 156

- Nagatsuma, Tsutomu**
Geomagnetic Storms – 240
Magnetosphere: Geomagnetic Storms – 90
- Nagegeli, R. E.**
Hot Cell Facility (HCF) Safety Analysis Report – 186
- Nakagawa, Shin-Ichi**
Image Systems Using RFID Tag Positioning Information – 54
- Namkung, Juock S.**
Spectroscopy-Based Characterization of Single Wall Carbon Nanotubes – 46
- Namkung, Min**
Spectroscopy-Based Characterization of Single Wall Carbon Nanotubes – 46
- Nangia, R. K.**
Vortex Flow Dilemmas and Control on Wing Planforms on High Speed – 4
- Narita, Masashi**
Analysis of Apaf-1 and Caspase 9 in Tumorigenesis – 108
- Nazikian, R.**
New Interpretation of Alpha-Particle-Driven Instabilities in Deuterium-Tritium Experiments on the Tokamak Fusion Test Reactor – 189
- Nein, Max**
High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures – 65
- Nekkanti, Rama M.**
Development of Nickel Alloy Substrates for Y-Ba-Cu-O Coated Conductor Applications – 38
- Nelson, Peter S.**
The Prostate Expression Database (PEDB) – 106
- Nemani, Ramakrishna**
Automated Data Processing as an AI Planning Problem – 69
- Neugebauer, Marcia**
The Genesis Solar Wind Sample Return Mission – 236
- Neukom, Christian**
Mission Simulation Facility: Simulation Support for Autonomy Development – 160
- Newman, Timothy S.**
Stormtime Particle Energization with AMIE Potentials – 88
- Ng, Hou Tee**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59
- Nicolau, Alex**
COPPER: Compiler-Controlled On-Demand Approach to Power-Efficient Computing – 149
- Nikitkin, Michael N.**
Geoscience Laser Altimetry System (GLAS) On-Orbit Flight Report on the Propylene Loop Heat Pipes (LHPs) – 20
- Nikolajuk, M.**
Variability of Accretion Flow in the Core of the Seyfert Galaxy NGC 4151 – 218
- Nikoskinen, K. I.**
Electrostatic Image Theory for the Anisotropic Boundary – 172
- Nikroo, A.**
Coating and Mandrel Effects on Fabrication of Glow Discharge Polymer NIF Scale Indirect Drive Capsules – 177
Recent Progress in Fabrication of High-Strength Glow Discharge Polymer Shells by Optimization of Coating Parameters – 177
- Nilsson, B.**
Signal Processing for Acoustic Communications in Underwater Channels using Quadrature Amplitude Modulation – 50
- Nilsson, T.**
Protections Against HPM Front-Door Coupling: A Survey of Commercial Limiters – 53
- Nishio, S.**
Advanced High Performance Solid Wall Blanket Concepts – 195
- Nishizawa, A.**
Technical Report of National Aerospace Laboratory: Transition Process of Boundary Layers on a Low-Speed Wind-Tunnel Contraction Wall – 2
- Noah, Meg**
Validation Report for the Celestial Background Scene Descriptor (CBSD) stellar Point Sources Model CBSKY4 – 211
- Noah, Paul V.**
Validation Report for the Celestial Background Scene Descriptor (CBSD) stellar Point Sources Model CBSKY4 – 211
- Noble, R. J.**
Combining Electric and Sail Propulsion for Interplanetary Sample Return – 60
- Noel, B. W.**
Development of On-Line Temperature Measurement Instrumentation for Gasification Process Control. Semi-annual rept., 4/1/2000-9/31/2000 – 26
Development of On-Line Temperature Measurement Instrumentation for Gasification Process Control. Semi-annual rept. ending 4/01/2001 – 27
- Norris, Jay P.**
Gamma-Ray Bursts and Cosmology – 224
- Norstrud, Helge**
Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure – 3
- Noyes, H. P.**
Cosmological Calculation Suggesting a Threshold for New Physics at 5 TeV – 223
- Nuez, Jay**
Thermo Physics Facilities Branch Brochure ARC Jet Complex Fact Sheets, Hypervelocity Free-Flight Aerodynamic Facility Fact Sheets, Ames Vertical Gun Range Fact Sheets – 206
- Nygren, I.**
Recursive Terrain Navigation. Application of the Correlation Method – 160
- Nyholm, S. E.**
Electrical Equivalent Circuit Simulations of the Pulsed-Power Conditioning System TTHPM – 56
- Nyman, David W.**
Dynamic Tissue Culture from Prostate Biopsy Specimens as a model for Predicting Tumor Radiosensitivity to Ionizing Radiation Treatment – 126
- Obara, Takahiro**
Formation of the Magnetosphere and Magnetospheric Plasma Regime – 241
Magnetosphere: Formation of the Magnetosphere and Magnetospheric Plasma Regime – 89
- Obratsova, Anna Y.**
Biological Controls on the Precipitation of Chromium in Harbor Sediments – 33
- O'Donnell, Amanda**
The War Fighter's Stress Response: Telemetric and Noninvasive Assessment – 121
- Oeberg, T.**
Signal Processing for Acoustic Communications in Underwater Channels using Quadrature Amplitude Modulation – 50
- Ohiso, Yoshitaka**
A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 55
- Ohlsson, J.**
Improved Infrared Object Signature Calculations for SensorVision (Trade Mark) by the Use of RadTherm (Trade Mark) – 188
- Oikawa, T.**
Quantitative Tests of ELMs as Intermediate n Peeling-Ballooning Modes – 192
- Oka, Mitsuo**
High-Energy Particle Acceleration in the Heliosphere – 224
Solar and Solar Wind: High Energy Particle Acceleration in the Heliosphere – 239
- Okabayashi, M.**
Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – 195

- Okuno, Masayuki**
Recent Advances in Optical Switches Using Silica-based PLC Technology – 50
- Oi, Michael V.**
An Experimental Investigation of Leading Edge Vortices and Passage to Stall of Nonslender Delta Wings – 4
- Oldenburg, C.**
Intercomparison of Numerical Simulation Codes for Geologic Disposal of CO₂ – 84
- Oldham, Lloyd**
The Genesis Solar Wind Sample Return Mission – 236
- Oliver, Leonid**
A Performance Evaluation of the Cray X1 for Scientific Applications – 156
- Oliversen, Ronald**
Development and Operations of the Astrophysics Data System – 219
- Olofsson, N.**
Signal Processing for Acoustic Communications in Underwater Channels using Quadrature Amplitude Modulation – 50
- Olovsson, L.**
KRYP, a Finite Element Program for Crystal Plasticity – 27
- Oltmans, S. J.**
Insights into Tropical Tropospheric Ozone from the SHADOZ Network – 102
- Olyslager, F.**
Closed Form Solutions of Maxwell's Equations in the Computer Age – 140
- Omelchenko, Y. A.**
Interaction of Neutral Beam Injected Fast Ions with Ion Cyclotron Resonance Frequency Waves – 180
- Opila, Elizabeth J.**
C/SiC Life Prediction for Propulsion Applications – 31
- Ore, Christina M. Dalle**
Spectral Models of Kuiper Belt Objects and Centaurs – 216
- Ortega, A.**
Application- and Network-Cognizant Proxies – 155
- Osborne, T. H.**
Characteristics of the H-Mode Pedestal and Extrapolation to ITER – 191
Transport of ELM Energy and Particles into the SOL and Divertor of the DIII-D – 192
- Osbourne, T. H.**
Quantitative Tests of ELMs as Intermediate n Peeling-Ballooning Modes – 192
- Osher, Stanley**
Dynamic RCS: A Geometrical/Eulerian Approach to Computing High Frequency Radar Cross Sections – 165
- Ostman, Anders**
Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure – 3
- Ott, R.**
Cylindrical Wire Electrical Discharge Machining of Metal Bond Diamond Wheels Part II: Wheel Wear Mechanism – 45
- Otte, T. L.**
Implementation of an Urban Canopy Parameterization in MM5 for Meso-Gamma-Scale Air Quality Modeling Applications – 95
- Otte, T.**
Application of the Models-3 Community Multi-Scale Air Quality (CMAQ) Model System to SOS/Nashville 1999 – 84
- Overbay, Larry**
Standardized UXO Technology Demonstration Site Blind Grid Scoring Record No. 50. Site Location: Aberdeen Proving Ground – 71
- Oye, Ivar**
Simulation of Wind-Induced Vortex Flow and the Effect on a Helicopter Structural Failure – 3
- Pacchioli, David**
Astrobiology: The Search for Life in the Universe – 112
- Pagnutti, Mary**
Radiometric Characterization of IKONOS Multispectral Imagery – 77
- Palem, Krishna V.**
ASC3: Algorithmic Strategies for Compiler Controlled Caches – 151
- Palm, S. P.**
Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – 88
- Palm, Steven P.**
Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – 88
- Palmer, R.**
Muon Collier Design – 174
- Pang, Wanlin**
Automated Data Processing as an AI Planning Problem – 69
- Pantelatos, D. K.**
An Experimental Study of the Flow Around an Axisymmetric Body at High Angles of Attack – 6
- Pardo, G.**
Proceedings of the 2001 Earthquake Engineering Symposium for Young Researchers – 73
- Park, Cheol**
Spectroscopy-Based Characterization of Single Wall Carbon Nanotubes – 46
- Parker, S. F.**
TOSCA User-Guide – 150
- Parks, D. M.**
Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – 45
- Parry, Ronald J.**
Investigations of Thaxtomin Biosynthesis – 115
- Pasareani, Corina**
Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147
- Pasareanu, Corina**
Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 148
- Patera, Anthony T.**
From Materials to Missions Assess-Predict-Optimize: A Computational Approach to Adaptive Design – 161
- Patrick, Brian**
Integrated Optical Design Analysis (IODA): New Test Data and Modeling Features – 152
- Patrick, Marshall C.**
Support of Integrated Health Management (IHM) through Automated Analyses of Flowfield-Derived Spectrographic Data – 23
- Patterson, Don**
NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – 72
- Patterson, R. A.**
Marine Mammal Health: Development of Immunodiagnostic and Viral Diagnostic Methodologies and Reagents – 123
- Patton, B. W.**
Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17
- Pawel, S. J.**
Examination of Compatibility of Cavitation-Resistance Modifications to Type 316LN Stainless Steel in a Mercury Thermal Convection Loop – 39
Screening Test Results of Fatigue Properties of Type 316LN Stainless Steel in Mercury – 41
- Payne, C. K.**
Ultrafast Infrared Studies of Complex Ligand Rearrangements in Solution – 34
- Payne, J. E.**
Properties of Doped Bi-Based Superconductors – 197
- Pazandak, Paul**
Software Surveyor – 148
- Pearson, Todd**
Engine Blowdown Device – 73
- Pedersen, Liam**
Essential Autonomous Science Inference on Rovers (EASIR) – 235

- Terrain Model Registration for Single Cycle Instrument Placement – 235
- Pellissier, P.**
Pellissier H5 Hydrostatic Level – 184
- Pentakalos, Odysseas I.**
Performance Analysis of the Unitree Central File – 146
Performance Modeling of Network-Attached Storage Device Based Hierarchical Mass Storage Systems – 145
- Perez-Morano, Mirna**
Role of E-Cadherin Homophilic Contacts in the Inhibition of Cell Growth of Primary Breast Cells – 129
- Perl, J.**
Use of HepRep in GLAST – 218
- Persson, R.**
Aerosol Attenuation Model for Scandinavian Environment: Based on Measurements at Loevsætra in Uppland – 138
- Peterson, Peter Y.**
Investigation of the Erosion Characteristics of a Laboratory Hall Thruster – 22
- Pettersson, A.**
Ageing Control Number 3 of Propellants for Rocket Motors RB 75 Maverick – 46
- Pettersson, L.**
Radiation Characteristics of a Broadband Tapered Slot Antenna Array Demonstrator – 51
- Pettersson, U.**
The Potential for solar Heat for Industrial Processes: A Preliminary Study of Swedish Possibilities – 80
- Petty, C. C.**
Complete Suppression of the $m=2/n=1$ Neoclassical Tearing Mode using Electron Cyclotron Current Drive on DIII-D – 178
Discharge Improvement through Control of Neoclassical Tearing Modes by Localized ECCD in DIII-D – 192
- Philbin, J. S.**
Hot Cell Facility (HCF) Safety Analysis Report – 186
- Phillips, A. D.**
Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17
- Phillips, C. K.**
Investigations of Low and Moderate Harmonic Fast Wave Physics on CDX-U – 182
Plasma Dielectric Tensor for Non-Maxwellian Distributions in the FLR Limit – 182
- Piao, Daqing**
Monitoring Cancer Oxygenation Changes Induced by Ultrasound – 122
- Pine, Bill**
INSPIRE – 222
- Pisanich, Greg**
Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles – 21
Mission Simulation Facility: Simulation Support for Autonomy Development – 160
- Pisharody, Suresh**
Investigating the Partitioning of Inorganic Elements Consumed by Humans between the Various Fractions of Human Wastes: An Alternative Approach – 33
- Pizzorno, Giuseppe**
P53 Regulation of Uridine Phosphorylase Activity, Pyrimidine Salvage Pathway and Their Effects on Breast Cancer Therapy – 109
- Planckaert, L.**
Model of Unsteady Aerodynamic Coefficients of a Delta Wing Aircraft at High Angles of Attack – 6
- Platnick, Steven**
Global Multispectral Cloud Retrievals from MODIS – 69
- Pleim, J.**
Application of the Models-3 Community Multi-Scale Air Quality (CMAQ) Model System to SOS/Nashville 1999 – 84
- Pletzer, A.**
Plasma Dielectric Tensor for Non-Maxwellian Distributions in the FLR Limit – 182
- Pllice, Laura**
Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles – 21
Mission Simulation Facility: Simulation Support for Autonomy Development – 160
- Plouffe, D.**
Pellissier H5 Hydrostatic Level – 184
- Polk, Charles**
Pre-Game-Theory Based Information Technology (GAMBIT) Study – 165
- Pollack, Martha E.**
Plan-graph Based Heuristics for Conformant Probabilistic Planning – 141
- Polomarov, O.**
Self-Consistent System of Equations for a Kinetic Description of the Low-Pressure Discharges Accounting for the Nonlocal and Collisionless Electron Dynamics – 193
- Polonsky, J. M.**
Tuberculosis Infection Among Young Adults Enlisting in the USA Navy – 130
- Polsgrove, T. T.**
Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17
- Ponce, D.**
Tests and Performance on the Six Gyrotron System on the DIII-D Tokamak – 192
- Ponchak, Denise**
Digital Avionics – 12
- Ponder, Rebecca G.**
Mechanism of Mutation in Non-Dividing Cells – 127
- Pontelandolfo, J. M.**
Coating and Mandrel Effects on Fabrication of Glow Discharge Polymer NIF Scale Indirect Drive Capsules – 177
Recent Progress in Fabrication of High-Strength Glow Discharge Polymer Shells by Optimization of Coating Parameters – 177
- Porter, F. C.**
Application Framework and Data Model Prototype for the BaBar Experiment – 198
- Porter, Jason**
Coronal Heating, Spicules, and Solar-B – 238
- Potter, Rachel R.**
Use of Plastic Capillaries for Macromolecular Crystallization – 132
- Potts, L. V.**
Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – 97
- Pourrahimi, Shahin**
A 10 Kelvin Magnet for Space-Flight ADRs – 210
- Powell, Dan**
A Large Aperture Fabry-Perot Tunable Filter Based On Micro Opto Electromechanical Systems Technology – 188
- Powers, W. T.**
Support of Integrated Health Management (IHM) through Automated Analyses of Flowfield-Derived Spectrographic Data – 23
- Prabhakara, C.**
Regional Variability in Convection and Rain Retrievals from the TRMM Microwave Imager (TMI) – 101
- Prater, P.**
Discharge Improvement through Control of Neoclassical Tearing Modes by Localized ECCD in DIII-D – 192
- Preedy, Kristina S.**
Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0004: Advanced Sol-Gel Adhesion Processes – 44
- Presny, Doug**
Compressed Air System Survey at Army Industrial Facilities – 66
- Presson, Joan**
High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures – 65
- Prevost, Michael C.**
The War Fighter's Stress Response: Telemetric and Noninvasive Assessment – 121

- Price, M. W.**
Analysis of Radial Segregation in Directionally Solidified Hg(0.89)Mn(0.11)Te – 43
- Price, S. D.**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – 215
- Primm, R. T.**
Neutronic Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997. Volume 4, Part 6-Esada Plutonium Program Critical Experiments: Power Distribution Measurements – 28
- Prince, Simon A.**
An Experimental and Computational Study of the Aerodynamics of a Square Cross-Section Body at Supersonic Speeds – 160
- Pritchett, Amy**
Enabling CSPA Operations Through Pilot Involvement in Longitudinal Approach Spacing – 14
- Prosser, William H.**
Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature – 186
- Pruess, K.**
Intercomparison of Numerical Simulation Codes for Geologic Disposal of CO₂ – 84
- Pryor, Anna**
A Comparison of Techniques for Scheduling Fleets of Earth-Observing Satellites – 202
- Pulliam, Robert C.**
Validation of the Parameterized Real-Time Ionospheric Specification Model (PRISM) – 87
- Pun, B.**
Performance Evaluation of CMAQ and PM-CAMx for the July 1999 SOS Episode – 76
- Quarrie, D. R.**
Application Framework and Data Model Prototype for the BaBar Experiment – 198
- Quicklund, H.**
The Potential for solar Heat for Industrial Processes: A Preliminary Study of Swedish Possibilities – 80
- Quinn, Jerry**
Engine Blowdown Device – 73
- Rabin, Michael O.**
ASC3: Algorithmic Strategies for Compiler Controlled Caches – 151
- Raffray, R.**
Advanced High Performance Solid Wall Blanket Concepts – 195
- Rahmfeld, J.**
STU Black Holes and String Trial-ity – 220
- Raitses, Y.**
Diagnostic Setup for Characterization of Near-Anode Processes in Hall Thrusters – 12
- Electrostatic Probe with Shielded Probe Insulator Tube for Low Disturbing Plasma Measurements in Hall Thrusters – 195
- Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster – 189
- Raj, P.**
An Assessment of CFD Effectiveness for Vortex Flow Simulation to Meet Preliminary Design Needs – 8
- Rajagopalan, T.**
Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25
- Rajaraman, A.**
Braneless Black Holes – 174
- Counting Schwarzschild and Charged Black Holes – 220
- Supersymmetric Rotating Black Holes and Attractors – 219
- Ramachandran, N.**
Magnetic Control of Solutal Buoyancy-driven Convection – 63
- Ramakrishnan, Satesh**
Plan-graph Based Heuristics for Conformant Probabilistic Planning – 141
- Ramakrishnan, Viswanathan**
Determining Effects of Genes, Environment, and Gene X Environment Interaction That Are Common to Breast and Ovarian Cancers Via Bivariate Logistic Regression – 125
- Ramirez, Ana M.**
Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – 205
- Ramirez-Cuesta, A. J.**
TOSCA User-Guide – 150
- Rand, J.**
Thirteenth Workshop on Crystalline Silicon Solar Cell Materials and Processes. Extended Abstracts and Papers – 79
- Range, Shannon Kdoah**
Brief History of Gyroscopes – 178
- Ratcliff, B.**
Optical Properties of the DIRC Fused Silica Cherenkov Radiator – 181
- Rathz, T. J.**
A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – 42
- Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – 42
- Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42
- Raubenheimer, T.**
Calculation of the Coherent Synchrotron Radiation Impedance from a Wiggler – 173
- Rausch, R. D.**
Transonic Drag Prediction on a DLR-F6 Transport Configuration Using Unstructured Grid Solvers – 62
- Ray, Richard I.**
A Comparison of Biotic and Inorganic Sulfide Films – 34
- Reale, Oreste**
Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space – 98
- Rectenwald, Michael D.**
Effective Coordination of Multiple Intelligent Agents for Command and Control – 158
- Redaelii, S.**
Comparative Assessment of Simulation Tools for Beam Delivery Systems of Linear Colliders – 166
- Redeker, G.**
A New Vortex Flow Experiment for Computer Code Validation – 150
- Reece, W. D.**
Development of Real-Time Measurement of Effective Dose for High Dose Rate Neutron Fields – 177
- Reed, Daniel A.**
High-Performance Input/Output Systems for Parallel Computers – 142
- Reed, Helen**
Three Corner Sat Constellation – 16
- Rees, J. R.**
Symplecticity in Beam Dynamics: An Introduction – 171
- Regina, J. R.**
Fe-Al Weld Overlay and High-Velocity Oxy-Fuel Thermal Spray Coatings for Corrosion Protection of Waterwalls in Fossil Fired Plants with Low NO_x Burners – 34
- Reid, Mark J.**
Measurement of Precision Geometric Distances to Three Anchor Points in the Local Universe – 67
- Reif, John**
Image Compression: Algorithms and Architectures – 146
- Reimerdes, H.**
Resistive Wall Modes and Plasma Rotation in DIII-D – 192
- Reis, D. A.**
Emittance Measurements from a Laser Driven Electron Injector – 187
- ReisdeCarvalho, Claudio Jose**
Biogeochemical Cycles in Degraded Lands – 85
- Ren, Y.**
Flux Rope Acceleration and Enhanced Magnetic Reconnection Rate – 220

- Requist, R.**
Elementary Aharonov-Bohm System in Three Space Dimensions: Quantum Attraction with no Classical Force – 199
- Rezin, Marc**
Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles – 75
- Rhodes, Jason**
Emission Line Galaxies in the STIS Parallel Survey – 217
- Rhoney, B. K.**
Cylindrical Wire Electrical Discharge Machining of Metal Bond Diamond Wheels Part II: Wheel Wear Mechanism – 45
- Riall, Sara**
A 10 Kelvin Magnet for Space-Flight ADRs – 210
- Rice, C.**
Restricting the Use of Reverse Thrust as an Emissions Reduction Strategy (Revised) – 85
- Richardson, T. J.**
Lithium-Based Electrochromic Mirrors – 39
- Ridley, Aaron J.**
Stormtime Particle Energization with AMIE Potentials – 88
- Riedi, Jerome C.**
Global Multispectral Cloud Retrievals from MODIS – 69
- Rio, J. A. del**
Science and Technology Text Mining: Citation Mining of Dynamic Granular Systems – 205
- Ritter, Roxane M.**
Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – 36
- Rocca, Xavier**
CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft – 3
- Rodeck, Ulrich**
Molecular Characterization of Squamous Cell Carcinomas Derived From Recessive Dystrophic Epidermolysis Bullosa – 134
- Rodhe, H.**
Precipitation Chemistry Studies in India: A Search for Regional Patterns – 100
- Rodin, Ervin Y.**
Air Transportation Network Routing and Scheduling – 9
- Rodriguez, Luis**
An On-line Technology Information System (OTIS) for Advanced Life Support – 207
- Rogers, J. R.**
A Liquid-Liquid Transition in an Undercooled Ti-Zr-Ni Liquid – 42
- Difference in Icosahedral Short-Range Order in Early and Late Transition Metals Liquids – 42
- Surface Tension and Viscosity of Quasicrystal-Forming Ti-Zr-Ni Alloys – 42
- Rogers, Ted**
Phase-Synchronized Modal Testing of Mirror Membrane – 188
- Rogowski, Robert S.**
Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature – 186
- Rohrbaugh, Dennis K.**
Hydrolysis of Levinstein Mustard (H) – 36
- Rojo, J. C.**
Simulation of Transport Phenomena in Aluminum Nitride Single-Crystal Growth – 196
- Romagnolo, Donato F.**
A Molecular Model for Repression of BRCA-1 Transcription by the Aryl Hydrocarbon Receptor – 105
- Roman, D. R.**
Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – 97
- Romani, R. W.**
Gamma-Ray Blazar Content of the Northern Sky – 223
- Romano, A. J.**
Preliminary Observations Regarding LDV Scans of Panels Excited by Broadband Actuators at the US Capitol – 72
- Rosenberg, Carol L.**
Genes Differentially Expressed at the Transition from Premalignancy to Carcinoma – 106
- Rosenberg, Susan**
Mechanism of Mutation in Non-Dividing Cells – 127
- Rosenblum, Jean-Pierre**
CFD Prediction of Vortex Breakdown on Delta Wings for Military Aircraft – 3
- Rosenfeld, Michael G.**
The Role of N-CoR During Normal Mammary Gland Development – 109
- Rosseel, T. M.**
Heavy Section Steel Irradiation Program Monthly Letter Status Report for March 2001 – 41
- Rottman, G.**
SORCE and Future Satellite Observations of Solar Irradiance – 239
- Roush, Ted L.**
Essential Autonomous Science Inference on Rovers (EASIR) – 235
- Roy, Sumit**
Telecommunication Networks for Mobile & Distributed Communications/ Computing – 52
- Rudakov, D. L.**
Transport by Intermittency in the Boundary of the DIII-D Tokamak – 180
- Ruggiero, F.**
Symplectic Beam-Beam Interaction with Energy Change – 166
- Ruland, R.**
Pellissier H5 Hydrostatic Level – 184
- SLAC Design and Manufacturing Process of Sphere-Mounted Reflectors – 187
- Russell, Jeffrey**
Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+ – 67
- Rutledge, G.**
Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – 45
- Rutqvist, J.**
Intercomparison of Numerical Simulation Codes for Geologic Disposal of CO₂ – 84
- Ryan, M. A. K.**
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
- Ryan, M. A.**
Tuberculosis Infection Among Young Adults Enlisting in the USA Navy – 130
- Ryan, Margaret A.**
Predictors of Navy Attrition. II. A Demonstration of Potential Usefulness for Screening – 111
- Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – 128
- Ryan, Robert E.**
Radiometric Characterization of IKONOS Multispectral Imagery – 77
- Ryan, Robert**
Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+ – 67
- Ryd, A.**
Distributed Offline Data Reconstruction in BABAR – 167
- Sabol, Chris**
A Role for Improved Angular Observations in Geosynchronous Orbit Determination – 17
- Sadakata, Toru**
NTT Technical Review – 53
- Sagara, S.**
Advanced High Performance Solid Wall Blanket Concepts – 195
- Saito, Hiroshi**
Image Systems Using RFID Tag Positioning Information – 54

- Saitoh, T.**
Thirteenth Workshop on Crystalline Silicon Solar Cell Materials and Processes. Extended Abstracts and Papers – 79
- Sajaev, V.**
Complete Characterization of a Chaotic Optical Field using a High-Gain Self-Amplified Free-Electron Laser – 188
- Sakai, Yoshihisa**
NTT Technical Review – 53
- Sakata, Tomomi**
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 186
- Salih, S.**
BaBar Web Job Submission with Globus Authentication and AFS Access – 154
- Salt, Joel**
EOSDIS Project on High-Performance I/O Techniques – 146
- Samorezov, Sergey**
Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – 18
- Samorodnitsky, Gennady**
Modeling and Analysis of Uncertain Time-Critical Tasking Problems (UTCTP) – 164
- Samuel, M. A.**
Asymptotic Padé Approximant Predictions: up to Five Loops in QCD and SQCD – 174
- Sangfelt, E.**
Signal Processing for Acoustic Communications in Underwater Channels using Quadrature Amplitude Modulation – 50
- Sangrar, Waheed**
The Role of Fps in Tumor-Associated Angiogenesis – 118
- Sankaran, S. N.**
Development of Oxidation Protection Coatings for Gamma Titanium Aluminide Alloys – 43
- Santos, Eugene, Jr.**
Large-Scale Multi-Agent Distributed Mission Planning and Execution in Complex Dynamic Environments – 52
- Santos, Eugene, Jr**
Verification and Validation of Embedded Knowledge-Based Software Systems – 205
- Sanyal, Soumya**
A Hierarchical and Distributed Approach for Mapping Large Applications to Heterogeneous Grids using Genetic Algorithms – 156
- Sarazin, X.**
Optical Properties of the DIRC Fused Silica Cherenkov Radiator – 181
- Sargent, Randy**
Terrain Model Registration for Single Cycle Instrument Placement – 235
- Sarrafzadeh, Majid**
PACT: Power Aware Compilation and Architectural Techniques – 151
- Sasaki, Chester**
The Genesis Solar Wind Sample Return Mission – 236
- Savage, S. J.**
Production of Nanocomposites – 29
- Savinov, V.**
Measurements of the Meson-Photon Transition Form Factors of Light Pseudoscalar Mesons at Large Momentum Transfer – 183
- Sawada, Renshi**
Development of a Large-scale 3D MEMS Optical Switch Module – 187
- Sawaki, Minako**
NTT Technical Review – 53
- Sawicki, Jerzy T.**
High Temperature Fusion Reactor Cooling Using Brayton Cycle Based Partial Energy Conversion – 22
- Scattergood, R. O.**
Cylindrical Wire Electrical Discharge Machining of Metal Bond Diamond Wheels Part II: Wheel Wear Mechanism – 45
- Scavone, Gary**
Mental Representation of Auditory Sources – 184
- Schiller, Stephen**
Radiometric Characterization of IKONOS Multispectral Imagery – 77
- Schlaefel, Constance E.**
Thermal Conductivity Evolution During Initial Stage Sintering – 28
- Schlaefel, Constance**
The Specific Refractive Index Increment for Isobutyl Poly-Styrene Copolymers – 37
- Schmidlin, F. J.**
Insights into Tropical Tropospheric Ozone from the SHADOZ Network – 102
- Schneider, Nathan A.**
Ship Shock Trial Modeling and Simulation of USS WINSTON S. CHURCHILL (DDG 81) – 149
- Schoeberl, M. R.**
Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – 85
- Schoffstoll, Dayna L.**
Space Shuttle Main Engine Implications for the Abort-to-Orbit Off-the-Pad Study – 24
- Schroeder, Charles E.**
Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – 162
- Schroeder, W.**
Normal Shock Vortex Interaction – 7
- Schubert, Siegfried**
Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – 100
- Schulte, D.**
Comparative Assessment of Simulation Tools for Beam Delivery Systems of Linear Colliders – 166
- Schultz, James**
Crafting Flight: Aircraft Pioneers and the Contributions of the Men and Women of NASA Langley Research Center – 243
- Schultz, J.**
Proposal for the Detection of Relativistic Anti-Hydrogen Atoms Produced by Pair Production with Positron Capture – 200
- Schultz, K. R.**
Large-Scale Production of Hydrogen by Nuclear Energy for the Hydrogen Economy – 35
- Schwandt, C. S.**
Genesis Discovery Mission: Science Canister Processing at JSC – 237
- Schwartz, Richard A.**
RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – 241
- Schwarz, C. M.**
Genesis Discovery Mission: Science Canister Processing at JSC – 237
- Schwarzenberg-Czerny, A.**
Variability of Accretion Flow in the Core of the Seyfert Galaxy NGC 4151 – 218
- Schwenk, David M.**
Systems-Level Energy Audit for Main Complex, Construction Engineering Research Laboratory – 81
- Schwiening, J.**
Optical Properties of the DIRC Fused Silica Cherenkov Radiator – 181
- Scotti, Stephen J.**
Structures and Materials Technologies for Extreme Environments Applied to Reusable Launch Vehicles – 75
- Scripa, R. N.**
Analysis of Radial Segregation in Directionally Solidified Hg(0.89)Mn(0.11)Te – 43
- Scudiere, M. B.**
Dual Mode Inverter Control Test Verification – 57
- Seals, James**
Engine Blowdown Device – 73
- Seebaugh, William R.**
Summary of the Cloud Tracking and Sampling Experiments Conducted During the DIPOLE ORBIT and DIPOLE EAST Experiments – 96
- Seetharaman, Venkat**
Development of Nickel Alloy Substrates for Y-Ba-Cu-O Coated Conductor Applications – 38

- Segawa, Toru**
A High-speed Tunable Optical Filter Using a Semiconductor Ring Resonator – 55
- Seger, Yvette M.**
Genetic Requirements for the Transformation of Human Cells – 117
- Segletes, Steven B.**
Analysis of the Noneroding Penetration of Tungsten Alloy Long Rods into Aluminum Targets – 41
- Selvamurugan, Nagarajan**
Collagenases in Breast Cancer Cell-Induced Metastatic Tumor Growth and Progression – 116
- Sen, Koushik**
EAGLE can do Efficient LTL Monitoring – 158
EAGLE Monitors by Collecting Facts and Generating Obligations – 148
Rule-Based Runtime Verification – 158
- Seo, J.**
Spectroscopy-Based Characterization of Single Wall Carbon Nanotubes – 46
- Sessler, A.**
Muon Collier Design – 174
- Sevilla, Donald**
The Genesis Solar Wind Sample Return Mission – 236
- Sexton, L. E.**
Observations and Calibrations of DMSP F15 SSM Data December 1999 - October 2000 – 48
- Shah, Ankoor S.**
Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – 162
- Shalaev, V.**
PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – 3
- Shamkova, M.**
Calabi-Yau Black Holes – 222
- Shan, Hongzhang**
A Performance Evaluation of the Cray X1 for Scientific Applications – 156
- Shapiro, Linda G.**
A Visual Database System for Image Analysis on Parallel Computers and its Application to the EOS Amazon Project – 159
- Shaver, David C.**
Solid State Research Quarterly Technical Report 2003:3 – 58
- Shaw, David T.**
Flux-Pinning of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ High Tc Superconducting Tapes Utilizing $(\text{Sr,Ca})_{14}\text{Cu}_{24}\text{O}_{(41+\delta)}$ and $\text{Sr}_2\text{CaAl}_2\text{O}_6$ Defects – 35
- Shaw, K. A.**
Evaluation of Emission Characteristics Downstream of Diesel Oxidation Catalyst Technology – 84
- Shellenbarger, Zane**
Bistable Reflective Etalon (BRET) – 56
- Shepherd, J. Marshall**
A Downscaling Analysis of the Urban Influence on Rainfall: TRMM Satellite Component AMS Conference on Satellite Meteorology and Oceanography – 98
- Sheppard, M.**
Geometrization of Matter Proposal in the Barrett-Crane Model and Resolution of Cosmological Problems – 217
- Shi, Yijian**
Polymer Light-Emitting Diode (PLED) Process Development – 57
- Shibata, Tomohiro**
Recent Advances in Optical Switches Using Silica-based PLC Technology – 50
- Shibata, Tsugumichi**
NTT Technical Review – 53
- Shibata, Yasuo**
Monolithically Integrated 64-channel WDM Channel Selector – 54
- Shih, A. J.**
Cylindrical Wire Electrical Discharge Machining of Metal Bond Diamond Wheels Part II: Wheel Wear Mechanism – 45
- Shima, Naoko**
Recombinational Repair Genes and Breast Cancer Risk – 112
- Shimazu, Hironori**
Magnetosphere: Space Weather Research with Computer Simulations – 89
Space Weather Research with Computer Simulations – 154
- Shimokawa, Fusao**
High-speed Switching Operation in a Thermocapillarity Optical Switch for Application to Photonic Networks – 186
- Shin, Young S.**
Ship Shock Trial Modeling and Simulation of USS WINSTON S. CHURCHILL (DDG 81) – 149
- Shipman, Mark**
Essential Autonomous Science Inference on Rovers (EASIR) – 235
- Shirron, P. J.**
A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74
- Shirron, Peter J.**
Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – 70
- Shirron, Peter**
A 10 Kelvin Magnet for Space-Flight ADRs – 210
- Shmakova, M.**
STU Black Holes and String Trial-ity – 220
- Showalter, S. K.**
Initial Screening of Thermochemical Water-Splitting Cycles for High Efficiency Generation of Hydrogen Fuels Using Nuclear Power – 32
- Shrivastava, S.**
Contract Representation for Run-Time Monitoring and Enforcement – 138
Model Checking Correctness Properties of Electronic Contracts – 139
- Shults, Clifford W.**
Alpha Synuclein in a Model of Multiple System Atrophy – 130
- Sidhwa, Anahita**
Cratering of the Moon – 231
Kepler's Laws of Planetary Motion – 221
Phases of the Moon – 226
The Center of the Galaxy – 214
The Optical Telescope – 213
The Sun – 213
- Sihvola, A. H.**
Electrostatic Image Theory for Two Intersecting Conducting Spheres – 173
- Sihvola, A.**
Electromagnetics Laboratory Annual Report 2002 – 172
- Simcox, Amanda A.**
Development of an erbB Antagonist – 124
- Simon, Burkhard**
Technical Evaluation Report Part B - Heat Transfer and Cooling in Propulsion and Power Systems – 13
- Simon, H.**
High Performance Computing Clusters, Constellations, MPPs, and Future Directions – 140
- Simon, Steven B.**
The First Rock in the Solar System – 227
- Simov, V. N.**
What are the Causes of the Formation of the Sub-Alfvenic Flows at the High Latitude Magnetopause – 18
- Simpson, Graham M.**
An Experimental and Computational Study of the Aerodynamics of a Square Cross-Section Body at Supersonic Speeds – 160
- Simpson, Joanne**
An Equation for Moist Entropy in a Precipitating and Icy Atmosphere – 102
- Sin, S. J.**
Chiral Rings, Mirror Symmetry and the Fate of Localized Tachyons – 169
- Singer, S. Fred**
The Ph-D Project: Manned Expedition to the Moons of Mars – 233

- Singh, Nagendra**
End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Ionospheric Cusp and Resulting Ion Outflow to the Magnetosphere – 80
- Singhal, Mukesh**
A Scalability Model for ECS's Data Server – 144
- Sink, Sam**
Synthetic Aperture Radar (SAR) Automatic Target Recognition (ATR) parametric Study – 68
- Sinton, R.**
Thirteenth Workshop on Crystalline Silicon Solar Cell Materials and Processes. Extended Abstracts and Papers – 79
- Siskaninetz, William J.**
Ohio State University Cooperative Research and Development Agreement (CRDA) . Crystal Growth by Molecular Beam Epitaxy (MBE) and Characterization of Optoelectronic Devices – 72
- Skinner, David**
A Performance Evaluation of the Cray X1 for Scientific Applications – 156
- Skorobogatiy, M.**
Design and Simulation of Transmission Properties of Hollow Bragg Fibers Fabricated from Omnidirectionally Reflective Composite Dielectric Materials – 58
- Skrinsky, A.**
Muon Collier Design – 174
- Slack, J. L.**
Lithium-Based Electrochromic Mirrors – 39
- Smirnov, A. Y.**
Effective Mass of the Electron Neutrino in Beta Decay – 185
- Smith, B.**
Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127

Tuberculosis Infection Among Young Adults Enlisting in the USA Navy – 130
- Smith, D.**
BaBar Web Job Submission with Globus Authentication and AFS Access – 154
- Smith, David E.**
Plan-graph Based Heuristics for Conformant Probabilistic Planning – 141
- Smith, Eric A.**
Leveraging Improvements in Precipitation Measuring from GPM Mission to Achieve Prediction Improvements in Climate, Weather and Hydrometeorology – 99

NASA's Scientific Agenda for GPM Mission – 96

Use of Collocated KWAJEX Satellite, Aircraft, and Ground Measurements for Understanding Ambiguities in TRMM Radiometer Rain Profile Algorithm – 96
- Smith, Henry I.**
Sub-1nm Patterning Accuracy via Spatial-Phase Locking – 60
- Smith, J.**
Unsteady RANS Calculations for the GFSI Bump Preliminary Study Using EURANUS 5.3 – 1
- Smith, Jeffrey**
NASA Virtual Glovebox: An Immersive Virtual Desktop Environment for Training Astronauts in Life Science Experiments – 19
- Smith, Nick**
The Genesis Solar Wind Sample Return Mission – 236
- Smith, T. C.**
Are Gulf War Veterans Experiencing Illness Due to Exposure to Smoke from Kuwaiti Oil Well Fires? Examination of Department of Defense Hospitalization Data – 131

Ten Years and 100,000 Participants Later: Occupational and Other Factors Influencing Participation in US Gulf War Health Registries – 127
- Smithie, D. N.**
Plasma Dielectric Tensor for Non-Maxwellian Distributions in the FLR Limit – 182
- Sniadecki, Nathan**
Field-effect Flow Control in Polymer Microchannel Networks – 61
- Snyder, P. B.**
ELM Particle and Energy Transport in the SOL and Divertor of DIII-D – 191

Quantitative Tests of ELMs as Intermediate n Peeling-Ballooning Modes – 192
- Sobagaki, T.**
Technical Report of National Aerospace Laboratory: Transition Process of Boundary Layers on a Low-Speed Wind-Tunnel Contraction Wall – 2
- Soh, Ken-Ichiro**
Image Systems Using RFID Tag Positioning Information – 54
- Sohma, Shunichi**
Recent Advances in Optical Switches Using Silica-based PLC Technology – 50
- Sohn, Chang W.**
Systems-Level Energy Audit for Main Complex, Construction Engineering Research Laboratory – 81
- Sokoloff, Mitchell H.**
Neoadjuvant Anti-Angiogenesis Therapy for Prostate Cancer – 127
- Solaiman, E.**
Contract Representation for Run-Time Monitoring and Enforcement – 138

Model Checking Correctness Properties of Electronic Contracts – 139
- Solbrig, A.**
Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – 32
- Soltesz, S.**
Washing Bridges to Reduce Chloride – 31
- Sonnenschein, J.**
Duality and Other Exotic Gauge Dynamics in Softly Broken Supersymmetric QCD – 171
- Soper, John W.**
Simultaneous Determination of Cocaine, Cocaethylene, and Their Possible Pentafluoropropylated Metabolites and Pyrolysis Products by Gas Chromatography/Mass Spectrometry – 37
- Sowards-Emmerd, D.**
Gamma-Ray Blazar Content of the Northern Sky – 223
- Spaleta, J.**
Investigations of Low and Moderate Harmonic Fast Wave Physics on CDX-U – 182
- Spann, Jim**
Conjugate Auroral Imagery – 91
- Spence, Angela M.**
Computational Methods for Dynamic Stability and Control Derivatives – 14
- Spinhrne, J. D.**
Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – 88
- Spinhrne, James D.**
Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – 88
- Sporre, L.**
Annual Report 2002 on FOI:s Research on Modelling and Simulation – 140
- Spruce, Joseph P.**
Use of IKONOS Data for Mapping Cultural Resources of Stennis Space Center, Mississippi – 79
- Spudis, Paul D.**
Ice on the Bone Dry Moon – 234
- Sreenivas, K.**
Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – 66
- Srikanth, Sivasankaran**
Green Bank Telescope 290 to 395 MHz Feed Analysis and Modification for Operation in the 140 to 175 MHz Band – 60
- Sriramulu, S.**
Performance and Economics of Catalytic Glow Plugs and Shields in Direct Injection Natural Gas Engines for the Next Generation Natural Gas Vehicle Program – 73

- Staack, D.**
Electrostatic Probe with Shielded Probe Insulator Tube for Low Disturbing Plasma Measurements in Hall Thrusters – 195
Preliminary Results of Plasma Flow Measurements in a 2 kW Segmented Hall Thruster – 189
- Staguhn, J. G.**
Parameter Comparison for Low-Noise MoAu TES Bolometers – 74
- Stallcup, Michael**
High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures – 65
- Stansbery, E. K.**
Genesis Discovery Mission: Science Canister Processing at JSC – 237
- Stansbery, Eileen**
The Genesis Solar Wind Sample Return Mission – 236
- Startsev, B.**
Scaling of Cross Sections for Ion-Atom Impact Ionization – 35
- Startsev, E. A.**
Comparison of Quantum Mechanical and Classical Trajectory Calculations of Cross Sections for Ion-Atom Impact Ionization of Negative- and Positive-Ions for Heavy Ion Fusion Applications – 193
- Statham, G.**
Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets – 17
- Stavola, M.**
Thirteenth Workshop on Crystalline Silicon Solar Cell Materials and Processes. Extended Abstracts and Papers – 79
- Steer, A. P.**
Vortex Effects in the Dynamics of Underwater Weapons – 153
- Steggerda, Charles**
NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – 72
- Steiner, E.**
Consumer Views on Transportation and Energy – 85
- Steinhoff, John**
Dynamic RCS: A Geometrical/Eulerian Approach to Computing High Frequency Radar Cross Sections – 165
- Stephenson, Ronald R.**
Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0004: Advanced Sol-Gel Adhesion Processes – 44
- Sterling, T.**
High Performance Computing Clusters, Constellations, MPPs, and Future Directions – 140
- Stevens, C. O.**
Screening Test Results of Fatigue Properties of Type 316LN Stainless Steel in Mercury – 41
- Stevens, Ramsey**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59
- Stevenson, T. R.**
A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74
Parameter Comparison for Low-Noise MoAu TES Bolometers – 74
- Stigwall, J.**
Optimization of a Spatial Light Modulator for Beam Steering and Tracking Applications – 173
- Stone, Thomas A.**
Biogeochemical Cycles in Degraded Lands – 85
- Strait, E. J.**
Comparison of Sensors for Resistive Wall Mode Feedback Control. Milestone No. 145 'Containing Plasma Instabilities with Metal Walls' – 195
- Strizak, J. P.**
Screening Test Results of Fatigue Properties of Type 316LN Stainless Steel in Mercury – 41
- Strohmaier, E.**
High Performance Computing Clusters, Constellations, MPPs, and Future Directions – 140
- Strutz, Shane J.**
Holographic Optical Storage Using Photorefractive Polymers – 187
- Stupakov, G.**
Calculation and Optimization of Laser Acceleration in Vacuum – 175
Calculation of the Coherent Synchrotron Radiation Impedance from a Wiggler – 173
Single-Mode Coherent Synchrotron Radiation Instability – 182
- Su, G. J.**
Dual Mode Inverter Control Test Verification – 57
- Suarez, Vicente J.**
Vibration Modal Characterization of a Stirling Converter via Base-Shake Excitation – 18
- Sud, Yogesh**
Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – 100
- Summers, D. J.**
Search for Rare Charm Meson Decays at FNAL E791 – 169
- Sumpter, Kenneth B.**
Hydrolysis of Levinstein Mustard (H) – 36
- Sun, J.**
Supercritical Carbon Dioxide Extraction of Porogens for the Preparation of Ultralow Dielectric Constant Films – 25
- Sun, S.**
Controlled Synthesis and Assembly of FePt Nanoparticles – 39
Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – 39
- Surmacz, Eva**
Leptin (Obesity Protein) and Breast Cancer Metastasis – 129
- Susskind, L.**
Braneworld Black Holes – 174
Counting Schwarzschild and Charged Black Holes – 220
- Sussman, Alan**
EOSDIS Project on High-Performance I/O Techniques – 146
- Svensson, E.**
Development of an Instrument for Measuring Team Performance Potential – 137
Dynamic Measurement of the Operator for Future System Development – 11
- Swanson, D.**
Thirteenth Workshop on Crystalline Silicon Solar Cell Materials and Processes. Extended Abstracts and Papers – 79
- Swartzendruber, L.**
Flux-Pinning of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ High Tc Superconducting Tapes Utilizing $(\text{Sr,Ca})_{14}\text{Cu}_{24}\text{O}_{41+\delta}$ and $\text{Sr}_2\text{CaAl}_2\text{O}_6$ Defects – 35
- Sycara, Katia**
Effective Coordination of Multiple Intelligent Agents for Command and Control – 158
- Sznaier, Mario**
Multiobject Robust Control of Nonlinear Systems via State Dependent Coefficient Representations and Applications – 162
- Szofran, F. R.**
Analysis of Radial Segregation in Directionally Solidified $\text{Hg}(0.89)\text{Mn}(0.11)\text{Te}$ – 43
- Tajiima, H.**
Gamma-ray Polarimetry – 224
- Takagi, S.**
Technical Report of National Aerospace Laboratory: Transition Process of Boundary Layers on a Low-Speed Wind-Tunnel Contraction Wall – 2
- Takahashi, Ryo**
Research on Large-capacity Photonic Routers toward Optical Packet-switched Networks – 49
- Takakuwa, Y.**
Time-Resolved Photoelectron Spectroscopy of Oxidation on the $\text{Ti}(0001)$ Surface – 33
- Tallestrup, A.**
Muon Collier Design – 174

- Tamaki, Motonori**
Highly Accurate Similar Case Retrieval System for Call Centers Using Two-word Linked Expressions – 203
- Tan, C. Y.**
Proposed Interim Improvement to the Tevatron Beam Position Monitors with Narrow Band Crystal Filters – 176
- Tanabe, Hiromitsu**
Spot Information Navigator – 55
- Tanaka, Takashi**
Generation of Convection in the Magnetosphere-Ionosphere Coupling System – 93

Magnetosphere: Generation of Convection in the Magnetosphere-Ionosphere Coupling System – 90
- Tanikawa, Masaki**
Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 155
- Tanimoto, Steven L.**
A Visual Database System for Image Analysis on Parallel Computers and its Application to the EOS Amazon Project – 159
- Tao, Wei-Kuo**
An Equation for Moist Entropy in a Precipitating and Icy Atmosphere – 102

Goddard Cumulus Ensemble (GCE) Model: Application for Understanding Precipitation Processes – 90
- Tarter, Danny**
Engine Blowdown Device – 73
- Tate, Steve**
Image Compression: Algorithms and Architectures – 146
- Tatsuta, Tsutomu**
Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 55
- Taylor, Bill**
INSPIRE – 222
- Taylor, G. Jeffrey**
Dirty Ice on Mars – 229
Europa's Salty Surface – 226
Jupiter's Hot, Mushy Moon – 234
Life on Mars? – 230
Mercury Unveiled – 212
New Data, New Ideas, and Lively Debate about Mercury – 212
Origin of the Earth and Moon – 213
Rules for Identifying Ancient Life – 76
The Martian Interior – 230
The Moon Beyond 2002 – 227
Uranus, Neptune, and the Mountains of the Moon – 226
- Taylor, L.**
Physics Based Simulation of Reynolds Number Effects in Vortex Intensive Incompressible Flows – 66
- Taylor, P. T.**
Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – 97
- Taylor, R. P.**
Effect of Applied Pressure During Feeding of Critical Cast Aluminum Alloy Components with Particular Reference to Fatigue Resistance – 40
- Tebo, Bradley M.**
Biological Controls on the Precipitation of Chromium in Harbor Sediments – 33
- Telling, M. T. F.**
OSIRIS User Guide, 1st Edition – 173
- Tennant, A. F.**
Probing the Inflow/Outflow and Accretion Disk of Cygnus X-1 in the High State with the Chandra High Energy Transmission Grating – 216
- Teplitz, Harry I.**
Emission Line Galaxies in the STIS Parallel Survey – 217
- Teraoka, Y.**
Time-Resolved Photoelectron Spectroscopy of Oxidation on the Ti(0001) Surface – 33
- Terasawa, Toshio**
High-Energy Particle Acceleration in the Heliosphere – 224

Solar and Solar Wind: High Energy Particle Acceleration in the Heliosphere – 239
- Terrie, Greg**
Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+ – 67
- Terris, B. D.**
X-Ray Studies of Magnetic Nanoparticle Assemblies – 172
- Terry, Joseph**
Recent Observing System Simulation Experiments at the NASA DAO – 101
- Thiele, J. U.**
X-Ray Absorption and Diffraction Studies of Magnetic Nanoparticle Assemblies – 26

X-Ray Studies of Magnetic Nanoparticle Assemblies – 172
- Thomas, David J.**
C/SiC Life Prediction for Propulsion Applications – 31
- Thomas, E. L.**
Instrumentation for Research on the Microstructure Processing and Mechanical Performance of Polymeric Nanocomposites – 45
- Thomas, J. B.**
An Analysis of Gravity-Field Estimation Based on Intersatellite Dual-1-Way Biased Ranging – 86
- Thome, Kurtis**
Radiometric Characterization of IKONOS Multispectral Imagery – 77
- Thomer, O.**
Normal Shock Vortex Interaction – 7
- Thompson, A. M.**
Insights into Tropical Tropospheric Ozone from the SHADOZ Network – 102
- Thompson, D. J.**
Future Facilities for Gamma-Ray Pulsar Studies – 224
- Thomson, T.**
Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – 39

X-Ray Absorption and Diffraction Studies of Magnetic Nanoparticle Assemblies – 26

X-Ray Studies of Magnetic Nanoparticle Assemblies – 172
- Thornton, M.**
Cold-Start and Warm-Up Driveability Performance of Hybrid Electric Vehicles Using Oxygenated Fuels: Piggyback Project to the Volatility Group Intermediate -Temperature Program (CM-138-02) – 23
- Tohmori, Yuichi**
Monolithically Integrated 64-channel WDM Channel Selector – 54
- Tokugawa, N.**
Technical Report of National Aerospace Laboratory: Transition Process of Boundary Layers on a Low-Speed Wind-Tunnel Contraction Wall – 2
- Tolbert, A. Kimberly**
RHESSI and Trace Observations of the 21 April 2002 X1.5 Flare – 241
- Tolt, Zhidan**
Polymer Light-Emitting Diode (PLED) Process Development – 57
- Tomita, Fumihiko**
Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards – 239
- Tomkinson, J.**
TOSCA User-Guide – 150
- Toney, M. F.**
High Anisotropy CoPtCrB Magnetic Recording Media – 172

Ion Beam Stabilization of FePt Nanoparticle Arrays for Magnetic Storage Media – 39

X-Ray Absorption and Diffraction Studies of Magnetic Nanoparticle Assemblies – 26

X-Ray Studies of Magnetic Nanoparticle Assemblies – 172
- Toothman, Darrell R.**
Science and Technology Text Mining: Hypersonic and Supersonic Flow – 203

- Torres, O.**
Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – 85
- Tourde, D.**
Reduction of the Noise and Gas Emissions Generated by the Activity of the Swedish Air Force Preliminary Studies – 83
- Tribukait, A.**
Measurements on Spatial Disorientation during Gondola Centrifugation – 136
- Trimble, Jay**
NASA's MERBoard: An Interactive Collaborative Workspace Platform – 235
- Trinh, Huu P.**
Investigation of Impinging Stream Vortex Chamber Concepts for Liquid Rocket Engine Applications – 23
- Trivedi, S. P.**
de Sitter Vacua in String Theory – 168
- Troy, Ed**
Integrated Optical Design Analysis (IODA): New Test Data and Modeling Features – 152
- Truccolo, Wilson**
Differentially Variable Component Analysis (dVCA): Identifying Multiple Evoked Components using Trial-to-Trial Variability – 162
- Trump, D. H.**
Tuberculosis Infection Among Young Adults Enlisting in the USA Navy – 130
- Tsai, Sophia Y.**
Role of Nuclear Receptor Coactivators, AIB-1 and SRC-1, in the Development of Breast Cancer – 114
- Tucker, Jim**
High Accuracy Thermal Expansion Measurement at Cryogenic Temperatures – 65
- Tuttle, J. G.**
A Deposited Magnetic Thermometer for Temperatures below 0.1 Kelvin – 74
- Tuttle, James G.**
Continuous Cooling from 10 K to 4 K Using a Toroidal ADR – 70
- Tuttle, James**
A 10 Kelvin Magnet for Space-Flight ADRs – 210
- Twombly, I. Alexander**
NASA Virtual Glovebox: An Immersive Virtual Desktop Environment for Training Astronauts in Life Science Experiments – 19
- Uenishi, Yuji**
Development of a Large-scale 3D MEMS Optical Switch Module – 187
- Uitto, Jouni**
Molecular Characterization of Squamous Cell Carcinomas Derived From Recessive Dystrophic Epidermolysis Bullosa – 134
- Unosson, M.**
KRYP, a Finite Element Program for Crystal Plasticity – 27
- Ushijima, Shigehiko**
Live Streaming Switch System for Wide-area, Low-cost, and High-quality Internet Broadcasting – 155
Peer-to-peer-based, High-quality Live Video Delivery System for Business-to-business Applications – 155
- Vaisberg, O. L.**
What are the Causes of the Formation of the Sub-Alfvénic Flows at the High Latitude Magnetopause – 18
- van Dam, J.**
Investigation of the IEC Safety Standard for Small Wind Turbine Design through Modeling and Testing – 2
- VanderWijngaart, Rob F.**
Performance Characteristics of the Multi-Zone NAS Parallel Benchmarks – 152
- VanDyke, M. K.**
Overview of Non-nuclear Testing of the Safe, Affordable 30-kW Fission Engine, Including End-to-End Demonstrator Testing – 22
- Varadarajan, U.**
Geometry, Topology and String Theory – 175
- Veidenbaum, Alex**
COPPER: Compiler-Controlled On-Demand Approach to Power-Efficient Computing – 149
- Venet, Arnaud**
Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147
- Vercoutere, W.**
Detection of Strand Cleavage And Oxidation Damage Using Model DNA Molecules Captured in a Nanoscale Pore – 32
- Verrilli, Michael J.**
C/SiC Life Prediction for Propulsion Applications – 31
- Vicente, Gilberto A.**
Moving NASA Remote Sensing Data to the GIS Environment for Health Studies – 77
- Vicente, Gilberto**
PAIRS, The GIS-Based Incident Response System for Pennsylvania, and NASA – 91
- Vieira, Ima Celia G.**
Biogeochemical Cycles in Degraded Lands – 85
- Vignola, J.**
Preliminary Observations Regarding LDV Scans of Panels Excited by Broadband Actuators at the US Capitol – 72
- Vijayaraghavan, K.**
Performance Evaluation of CMAQ and PM-CAMx for the July 1999 SOS Episode – 76
- Vikram, Chandra S.**
Instrument for Measuring Cryo CTE – 47
- Visser, Willem**
Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – 147
- vonFrese, R. R. B.**
Crustal Structure of the Iceland Region from Spectrally Correlated Free-air and Terrain Gravity Data – 97
- Vontela, N.**
A Publish/Subscribe Based Architecture of an Alert Server to Support Prioritized and Persistent Alerts – 143
- Vornberger, Patricia**
Possible Stick-Slip Mechanism for Whirlans Ice Stream – 92
- Votava, Petr**
Automated Data Processing as an AI Planning Problem – 69
- Vylet, V.**
Radiation Protection at High-Energy Electron Accelerators – 48
- Wada, Masato**
NTT Technical Review – 53
- Wade, M. R.**
Achieving and Sustaining Steady-State Advanced Tokamak Conditions on DIII-D – 190
Advanced Tokamak Profile Evolution in DIII-D – 194
Demonstration in the DIII-D Tokamak of an Alternate Baseline Scenario for ITER and Other Burning Plasma Experiments – 190
Stationary High-Performance Discharges in the DIII-D Tokamak – 190
- Wagner, George W.**
Hydrolysis of Levinstein Mustard (H) – 36
- Wagner, Michael**
Mission Simulation Facility: Simulation Support for Autonomy Development – 160
- Wales, Roxana**
NASA's MERBoard: An Interactive Collaborative Workspace Platform – 235
- Walker, Ameae M.**
Administration of Additional Phosphorylated Prolactin During Pregnancy Inhibits Mammary Ductal Branching and Promotes Premare Lobuloalveolus Development – 113
- Walker, G. J.**
An Assessment of the Potential for Increasing the Salvageability of Critical Combat Traumas Through First Responder Interventions – 132
- Walker, Gregory**
Local and Remote Sources of Precipitation during the 1993 Midwestern USA Flood – 100

- Wallace, T. A.**
Development of Oxidation Protection Coatings for Gamma Titanium Aluminide Alloys – [43](#)
- Wallen, K. H.**
Electrostatic Image Theory for Two Intersecting Conducting Spheres – [173](#)
- Walton, C. M.**
Restricting the Use of Reverse Thrust as an Emissions Reduction Strategy (Revised) – [85](#)
- Wang, C.**
Model Independent Analysis of Beam Dynamics in Accelerators – [169](#)
- Wang, L.**
Isolation of Microstructure in Proton-Irradiated Steels – [40](#)
- Wang, Paul C.**
A Training Program in Breast Cancer Research Using NMR Techniques – [113](#)
- Wanijek, Christopher**
A Polarized Universe – [227](#)
Baby Stars in Orion Solve Solar System Mystery – [214](#)
Fun Times with Cosmic Rays – [221](#)
How to Build a Supermassive Black Hole – [221](#)
Journey to the Center of a Neutron Star – [222](#)
Mapping the Baby Universe – [228](#)
More Hidden Black Hole Dangers – [229](#)
Ring Around the Black Hole – [229](#)
The Gamma-Ray Burst Next Door – [220](#)
- Ward, Irene M.**
Functional Analysis of Interactions Between 53BP1, BRCA1 and p53 – [105](#)
- Warne, J.**
Contract Representation for Run-Time Monitoring and Enforcement – [138](#)
- Warner, Brent**
Passive Superconducting Shielding: Experimental Results and Computer Models – [197](#)
- Warren, J. L.**
Genesis Discovery Mission: Science Canister Processing at JSC – [237](#)
- Was, G. S.**
Isolation of Microstructure in Proton-Irradiated Steels – [40](#)
- Washington, Rich**
Experimental Evaluation of Verification and Validation Tools on Martian Rover Software – [147](#)
Hybrid Discrete-Continuous Markov Decision Processes – [141](#)
- Watari, Shinichi**
Solar and Solar Wind: Solar Wind and Interplanetary Disturbances – [239](#)
Solar Wind and Interplanetary Disturbances – [240](#)
- Watarikawa, H.**
Amateur Radio on the International Space Station - Phase 2 Hardware System – [61](#)
- Waters, David J.**
In Vivo Testing of Chemopreventive Agents Using the Dog Model of Spontaneous Prostate Carcinogenesis – [104](#)
- Watson, Peter**
The Role of S100A7/RANBPM Interaction in Human Breast Cancer – [117](#)
- Weber, R.**
Performance and Economics of Catalytic Glow Plugs and Shields in Direct Injection Natural Gas Engines for the Next Generation Natural Gas Vehicle Program – [73](#)
- Wei, J.**
Hangtian Yixue Yu Yixue Gongscheng) Volume 16, Number 5, October 2003 – [16](#)
- Weiser, Douglas C.**
The Role of GADD34 (Growth Arrest and DNA Damage- Inducible Protein) in Regulating Apoptosis, Proliferation, and Protein Synthesis in Human Breast Cancer Cells – [115](#)
- Weiss, Ronald A.**
Quick Assessment of the Navy Mark V CBR Respirator After 13 Years in Storage – [137](#)
- Weitsman, Y. J.**
Aspects of the Mechanical Behavior of Stitched T300 Mat/Urethane 420 IMR Composite – [30](#)
- Weitz, Catherine M.**
Explosive Volcanic Eruptions on the Moon – [227](#)
- Welch, Danny R.**
Metastasis Genes in Breast Cancer Metastasis to Bone – [117](#)
- Wells, Davide**
Software Surveyor – [148](#)
- Wellstein, Anton**
The Role of a FGF-Binding Protein in Breast Cancer – [124](#)
- Welton, E. J.**
Atmospheric Measurements by the Geoscience Laser Altimeter System: Initial Results – [88](#)
Entrainment and Optical Properties of an Elevated Canadian Forest Fire Plume Transported into the Planetary Boundary Layer near Washington, D.C. – [85](#)
- Welton, Ellsworth**
Observations of Dust Using the NASA Geoscience Laser Altimeter System (GLAS): New New Measurements of Aerosol Vertical Distribution From Space – [88](#)
- Westerman, John F.**
Compressed Air System Survey at Army Industrial Facilities – [66](#)
- Westervelt, Eileen**
Systems-Level Energy Audit for Main Complex, Construction Engineering Research Laboratory – [81](#)
- White, B.**
BABAR: A Community Web Site in an Organizational Setting – [167](#)
- White, D. W.**
LLAMA (Lincoln Laboratory Advanced MARTHA Applications) Software Manual – [154](#)
- Whitten, R. C.**
Electrical Charging of the Clouds of Titan – [211](#)
- Whittum, D.**
Advanced Accelerator Technologies: A Snowmass '96 Subgroup Summary – [170](#)
- Wiedemeier, Todd H.**
Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation – [29](#)
- Wieder, Robert**
The Roles of FGF-2 TGF Beta and TGF Beta Receptor 2 in Breast Cancer Dormancy – [128](#)
- Wiens, R. C.**
Genesis Solar-Wind Sample Return Mission: The Materials – [237](#)
- Wiens, Roger C.**
The Genesis Solar Wind Sample Return Mission – [236](#)
- Wignarajah, Kanapathipillai**
Investigating the Partitioning of Inorganic Elements Consumed by Humans between the Various Fractions of Human Wastes: An Alternative Approach – [33](#)
- Wild, M. N.**
Translation of the Observations of Meteors Recorded in the Koryo-sa – [234](#)
- Wilkinson, Rodney**
Engine Blowdown Device – [73](#)
- Williams, D.**
PC Desktop Aerodynamic Models for Store Separation from Weapons Bay Cavities and Related Vortical Processes – [3](#)
- Williams, Diane**
Cognitive Measures of Vietnam-Era Prisoners of War – [131](#)
- Williams, Lisa R.**
Mechanism by which p66 Shc Suppresses Breast Cancer Tumorigenicity – [129](#)
- Williams, Shyla D.**
Analysis of Cocaine, Its Metabolites, Pyrolysis Products, and Ethanol Adducts in Postmortem Fluids and Tissues Using Zymark(r) Automated Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry – [36](#)

- Willis, R. D.**
Guidelines for the Application of SEM/EDX Analytical Techniques to Particulate Matter Samples – 68
- Wilner, David J.**
High Resolution Imaging of Circumstellar Disks at Millimeter Wavelengths – 212
- Wilson, J. W.**
Single Integrated Air Picture (SIAP) Attributes – 150
- Wincheski, Russell A.**
Spectroscopy-Based Characterization of Single Wall Carbon Nanotubes – 46
- Wintersteiner, Peter P.**
Application of Radiative Transfer Techniques to Background Clutter Mitigation – 150
- Witte, David W.**
Exhaust Simulation Testing of a Hypersonic Airbreathing Model at Transonic Speeds – 13
- Witte, J. C.**
Insights into Tropical Tropospheric Ozone from the SHADOZ Network – 102
- Wolff, Charles L.**
Reversing Flows and Heat Spike: Caused by Solar g-Modes? – 76
- Womersley, J.**
Weakly-Coupled Higgs Bosons and Precision Electroweak Physics – 170
- Wong, C. P. C.**
Advanced High Performance Solid Wall Blanket Concepts – 195
- Wong, Edmond**
Cooperative Multi-Agent Mobile Sensor Platforms for Jet Engine Inspection: Concept and Implementation – 159
- Wong, S. K.**
Large Aspect Ratio Limit of Neoclassical Transport Theory – 181
- Wong, W. K.**
STU Black Holes and String Triality – 220
- Wong-Ng, W.**
Flux-Pinning of Bi₂Sr₂CaCu₂O₈ + delta) High T_c Superconducting Tapes Utilizing (Sr,Ca)₁₄Cu₂₄O₄₁ + delta) and Sr₂CaAl₂O₆ Defects – 35
- Wood, H. John**
Supernovae and the Accelerating Universe – 217
- Woodgate, Bruce E.**
Emission Line Galaxies in the STIS Parallel Survey – 217
- Woods, T.**
SORCE and Future Satellite Observations of Solar Irradiance – 239
- Woolum, D.**
Genesis Solar-Wind Sample Return Mission: The Materials – 237
- Wordeman, Linda G.**
MCAK and Stathmin Upregulation in Breast Cancer Cells: Etiology and Response to Pharmacologic Reagents – 108
- Wright, C. O.**
The Midcourse Space Experiment Point Source Catalog Version 2.3 Explanatory Guide – 215
- Wright, K.**
Cold-Start and Warm-Up Driveability Performance of Hybrid Electric Vehicles Using Oxygenated Fuels: Piggyback Project to the Volatility Group Intermediate -Temperature Program (CM-138-02) – 23
- Wu, J.**
Calculation of the Coherent Synchrotron Radiation Impedance from a Wiggler – 173
- Wu, Meng-Chou**
Using Dual-wavelength Fiber Bragg Gratings for Temperature and Strain Sensing at Cryogenic Temperature – 186
- Wu, P.**
Automated Data Collection, Analysis, and Archival – 204
- Wu, S. Y.**
Performance Evaluation of CMAQ and PM-CAMx for the July 1999 SOS Episode – 76
- Wurtele, J.**
Advanced Accelerator Technologies: A Snowmass '96 Subgroup Summary – 170
- Wyatt, Colby A.**
Effect of a Single Nucleotide Polymorphism (NP) on Breast Cancer Invasion – 126
- Wylie, B.**
Derivation of a Tasseled Cap Transformation Based on Landsat 7 At-Satellite Reflectance – 15
- Xing, Lei**
Combining Electron With Intensity Modulated Photon Beams for Breast Cancer – 123
- Xu, H.**
Unsteady Flows and Airfoil-Vortex Interaction – 6
- Xue, Ding**
Selection of Aptamers for CED-9/Bcl-2 Family Cell Death Regulators and Their Application in Study of Apoptosis Regulation and Drug Design for Breast Cancer – 107
- Xue, Kefu**
Synthetic Aperture Radar (SAR) Automatic Target Recognition (ATR) parametric Study – 68
- Yakovlev, A.**
Logic Synthesis Avoiding State Space Explosion – 139
- Yamaguchi, Johji**
Development of a Large-scale 3D MEMS Optical Switch Module – 187
- Yamamoto, Tsuyoshi**
Development of a Large-scale 3D MEMS Optical Switch Module – 187
- Yamauchi, Yohei**
Coronal Heating, Spicules, and Solar-B – 238
- Yambert, M. W.**
Neutronic Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997. Volume 4, Part 6-Esada Plutonium Program Critical Experiments: Power Distribution Measurements – 28
- Yampolsky, N. A.**
Finite-Duration Seeding Effects in Powerful Backward Raman Amplifiers – 183
- Yan, Hong**
Localized Flow Control in High Speed Flows Using Laser Energy Deposition – 5
- Yang, L.**
Derivation of a Tasseled Cap Transformation Based on Landsat 7 At-Satellite Reflectance – 15
- Yaswen, Paul**
Cooperative Interactions During Human Mammary Epithelial Cell Immortalization – 134
- Ye, Qi**
The Highly Robust Electrical Interconnects and Ultrasensitive Biosensors Based on Embedded Carbon Nanotube Arrays – 59
- Yeager, Donald**
E-3 In-Flight Acoustic Exposure Studies and Mitigation Via Active Noise Reduction Headset – 11
- Yeh, Kao-San**
Global Weather Prediction and High-End Computing at NASA – 101
- Yelluru, G. K.**
Performance Evaluation of CMAQ and PM-CAMx for the July 1999 SOS Episode – 76
- Yentzen, Michael J.**
Oxygen: Not Just for Breathing Anymore – 242
- Yesha, Yelena**
Center of Excellence in Space Data and Information Sciences – 207
- Yingst, Aileen**
Remote Sensing – 78
- York, T. J.**
Translation of the Observations of Meteors Recorded in the Koryo-sa – 234
- Yoshida, Yukihiro**
Standardization of G-PON (Gigabit Passive Optical Network) in ITU-T – 55

Yoshigoe, A.

Time-Resolved Photoelectron Spectroscopy of Oxidation on the Ti(0001) Surface – [33](#)

Yoshimoto, Shigetoshi

Journal of the Communications Research Laboratory. Special Issue on Space Weather Forecast I: Study on Space Weather and its Hazards – [239](#)

Young, Larry A.

Actions, Observations, and Decision-Making: Biologically Inspired Strategies for Autonomous Aerial Vehicles – [21](#)

Young, Sylvia Y.

Recruit Assessment Program: Implementation at Marine Corps Recruit Depot, San Diego – [128](#)

Zagwodzki, Thomas

NASA's Photon-Counting SLR2000 Satellite Laser Ranging System: Progress and Applications – [72](#)

Zanoni, Vicki

Radiometric Characterization of IKONOS Multispectral Imagery – [77](#)

Synthesis of Multispectral Bands from Hyperspectral Data: Validation Based on Images Acquired by AVIRIS, Hyperion, ALI, and ETM+ – [67](#)

Zeng, Xiping

An Equation for Moist Entropy in a Precipitating and Icy Atmosphere – [102](#)

Zhang, B.

Effect of Applied Pressure During Feeding of Critical Cast Aluminum Alloy Components with Particular Reference to Fatigue Resistance – [40](#)

Zhang, S. N.

Probing the Inflow/Outflow and Accretion Disk of Cygnus X-1 in the High State with the Chandra High Energy Transmission Grating – [216](#)

Zhang, Sara

Better Weather Prediction and Climate Diagnostics Using Rainfall Measurements from Space – [98](#)

Zhang, Y.

Performance Evaluation of CMAQ and PM-CAMx for the July 1999 SOS Episode – [76](#)

Zheltovodov, Alexander

Localized Flow Control in High Speed Flows Using Laser Energy Deposition – [5](#)

Zhu, Dong-Ming

Thermal Conductivity and Stability of HfO₂-Y₂O₃ and La₂Zr₂O₇ Evaluated for 1650 °C Thermal/Environmental Barrier Coating Applications – [25](#)

Zhu, Quing

Monitoring Cancer Oxygenation Changes Induced by Ultrasound – [122](#)

Zimmermann, F.

Comparative Assessment of Simulation Tools for Beam Delivery Systems of Linear Colliders – [166](#)

Zolorev, M.

Calculation and Optimization of Laser Acceleration in Vacuum – [175](#)

Zwally H. Jay

ICESat's Laser Measurements of Polar Ice, Atmosphere, Ocean, and Land – [103](#)

Zylstra, G.

Derivation of a Tasseled Cap Transformation Based on Landsat 7 At-Satellite Reflectance – [15](#)